THE MARINE REVIEW

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PROPOSED REQUIREMENTS FOR SAILING VESSELS.

On Jan. 21 the house committee on merchant marine and fisheries gave a hearing to the advocates of the bill now before the committee which provides that sailing vessels shall be in charge of two licensed officers, just as is required in the case of steam vessels. The labor organizations are in favor of the passage of the measure and their representatives were permitted to argue in its favor on that date. In two weeks the representatives of the shipping interests concerned, who are antagonistic to the bill, are to be given a hearing.

The representatives of the labor unions argued on behalf of the measure that the law now requires on all steam vessels over 100 tons that the watch officers, consisting of master, chief mates and second or third mates, shall be licensed officers, and that sail vessels ought to be always in charge of licensed officers for the same reasons which prevail in the case of steamers. Under present conditions, it was asserted, sail vessels up to 700 tons are navigated by men who are not required by law to be licensed. While the licensed officers in steam vessels would be held responsible and would have to stand examination and investigation upon a collision, the master of a sailing vessel or the officer in charge, whether mate or second mate, would not be liable to any one.

It was urged that inasmuch as an act had been passed in 1898 requiring licensed officers on vessels of over 700 tons, it would be more consistent and satisfactory to extend the requirement to the smaller craft. A vessel large enough to be out over night or to have a destination far enough off to require her to navigate at night as well as during the day, should be placed in the same class with the larger vessels of 700 tons or more, said the speaker. There was no reason why a vessel of as much as 300 tons should be favored in this matter, as such a vessel might be a large schooner, able to do the same class of work as vessels of 500 or 600 tons, and staying out over night, running along the coast, on the same lines of travel as the larger sailing vessels.

A feeling was, however, evident among the committee that the limit of 300 tons was too low. Five hundred tons was suggested as a limit more likely to receive the assent of congress and of the president. An effort to change the law was made in 1906, but failed because the bill did not receive the president's signature.

As to the question whether the proposed legislation would make it necessary for owners to pay more to the men engaged in navigating vessels because of their possession of licenses, it was argued on the basis of the commissioner of navigation's report that for the year 1900 there were 1,024 licensed masters and 491 licensed mates; making a total of 1,515. There had been licensed about 200 each year subsequently, so that in the year 1905 there were 2 365 licensed masters and 1,203 licensed mates.

The same statistics showed that there were in 1906 550 sail vessels coming under the provisions of section 4438 of the revised statutes, namely, sail vessels over 700 gross tons. Therefore, the ratio of licensed masters to these vessels was 4 1/3 to 1, and the ratio of licensed mates was 2⅛ to 1. Inasmuch as a master's license covers a first mate's license, it was claimed that the supply exceeds the present demand in the ratio of perhaps 3¼ to 1.

Some stress was laid on the need of making the proposed requirement apply to barges in New York harbor.

MORE WIRELESS SAFEGUARDS.

Apropos of the subject of wireless telegraphy and the graphic demonstration of its efficiency with which the marine world has recently been startled, the question of keeping this communication up after the ship's machinery stops, appears to have been especially well provided for by the installations aboard the liners of the North German Lloyd Steamship Co. In this connection it will be recalled that the Republic's wireless apparatus was operated by storage batteries, after the flooding of her engine room, and that they finally gave out, although not until her operator had succeeded in transmitting the necessary messages.

The North German Lloyd steamships have a four-fold guarantee of the working of the wireless at all times, the current for its operation being supplied from one or the other of the two dynamos in the engine room which provide the current for the lighting of the steamer. Each of these dynamos is in a separate watertight compartment with the engine which runs it, they being so placed that one might be disabled without interfering with the working of the other. The lighting dynamos might, during an emergency, become disabled.

Accordingly, two additional dynamos have been installed in the Marconi house on the boat deck directly connected with the two electric lighting dynamos in the engine room, also auxiliary engine located several decks higher than the engine room. Every Marconi house is equipped with two complete sets of storage batteries, each capable of working continu-

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ously 20 hours. The storage batteries are of sufficient capacity to keep up ordinary communication for one round trip, without resorting to the dynamos. The additional apparatus installed give them a sending radius of between 450 and 600 miles and a receiving radius of from 1,200 to 1,600 miles.

REPORT TO THE CHICAGO HARBOR COMMISSION ON OBSTACLES TO CHICAGO'S WATER SHIPPING DEVELOPMENT.

(Continued from Jan. 28.)

"I said that all the package freight boats operating between Chicago and Buffalo were owned by the railroads with one exception.

"I will now consider that exception, the Jesse H. Farwell, of the Pacific Despatch line. The Pacific Coast Borax Co. has a plant on the south branch of the Chicago river. It brings to that plant large quantities of borax from its refinery located near the water in New Jersey. Mr. W. H. Follett, mayor of Tonawanda, N. Y., owns or controls some 35 or 40 canal boats, which he operates independently of the Erie Boatmen's Union. The Jesse H. Farwell and the Follett line of canal boats operate together and thus form a through canal and lake route for bringing borax from New Jersey to Chicago. The saving to the borax company from this arrangement in keeping rates down is considerable. The Pacific Despatch line is able to carry a small amount of package freight in addition to borax, but not enough to influence the situation materially. The Jesse Farwell can not make like arrangements with canal boat owners who are members of the Erie Boatmen's Union, nor will the railroad-owned lake lines make through rate arrangements with the Follett line of canal boats.

"Having become masters of the package freight business between Chicago and the seaboard, lake and canal as well as lake and rail, the railroads now appear to be striving to secure like control over the grain movement east. This year, for the first time, the railroads are charging more for carrying from Buffalo to the seaboard grain that is taken to Buffalo by boat, than the proportionate share of the all-rail haul from Chicago to the seaboard. The effect of this action has been to promote the movement of grain all rail, where it has not brought a diversion of traffic through Montreal. The boatmen's union on the Erie canal, in seeming disregard of the interests of its membership, has rigidly maintained the rate on grain by canal from Buffalo to the seaboard at five cents a bushel for the season of 1908, where the rate has been considerably lower in recent years. The result is that the greater proportion of the Erie canal boats are lying idle while the grain is moving east either all rail or is diverted through Montreal. The canal boats belonging to Mr. Follett, of Tonawanda, are an exception and are carrying all the traffic they can handle.

"Perhaps the grain situation can best be explained through the presentation of the following letter to certain railroad traffic managers from Mr. W. M. Hopkins, manager of the transportation department of the Chicago board of trade:

* * * * * *

"It is evident that providing better harbor facilities is not the whole of Chicago's interest in lake transportation. The eastern gateway must be kept open as well, if this community and others on the lake are to derive the full benefit of their location with reference to water transportation. The possible remedies are two, both of which should be invoked:

"1. The Interstate Commerce Commission should have the power to require rail carriers to make through route and joint rate arrangements with all responsible boat lines, on like reasonable conditions.

"2. Relief must be sought through the greater use of the enlarged Erie canal, or other water routes, when completed.

"As to the first suggested remedy, the Interstate Commerce Commission now has the power to require a railroad to make a through route and joint rate arrangement with a boat line where no satisfactory through rate exists. But that would not help the situation as between Chicago and eastern points by way of Buffalo, for in the purview of the statute there are existing 'satisfactory' through routes. The principle of equal treatment for all, however, requires that any responsible boat line shall be accorded the same through route arrangements that are given any other boat line.

"As to the second suggestion for relief, not a great deal can be expected from the Erie canal in its present form. The enlarged Erie canal, however, should be a great boon to Chicago and other western lake ports. But the work of construction is proceeding very slowly. The following figures concerning the progress of the work are taken from a map issued during the past summer by officials in charge of construction:

	Miles
Work under contract	134.0
Additional plans completed	107.1
Plans over 75 per cent completed	43.2
Other plans in progress	161.0

"The law under which the work of enlargement is being carried on was passed in 1903. Construction began in 1905. The canal authorities have encountered difficulties in making progress. Perhaps they are doing all they can under the circumstances. But the feeling among vessel men and shippers in Buffalo with regard to the early completion of the canal is decidedly pessimistic. The authorities in charge of construction do not make predicitions as to when the enlarged canal will be ready for use. Perhaps the pressure of public opinion could hasten progress. Chicago can do something to help create the necessary public opinion.

"The Canadian government is planning deeper water routes to the seaboard, which may prove of great importance to all western lake ports."

LACK OF VESSEL OWNERSHIP IN CHICAGO.

Mr. Sikes, in his discussion of this phase of Chicago's harbor problem, concedes that it has a most important bearing on future development. He says:

"Chicago is not a vessel-owning city. A comparatively small amount of Chicago capital is invested in craft that navigate the lakes. In proportion to their population and wealth Cleveland, Detroit and Buffalo have much larger investments in lake shipping. This fact may explain in part why our harbor facilities have been permitted to deteriorate in comparison with other lake ports. Large investments of capital in an industry are a great stimulus to public interest in the welfare of that industry. Even the newspapers of Chicago give much less space to shipping news than do the papers of other ports on the lakes. The Chicago papers give considerable space to railroad, insurance and other special lines, evidently because they have the readers who want information on these subjects. By the same token, they presumably print little lake shipping news because they think few readers are specially interested in that topic. More vessel ownership in Chicago would tend to produce a change in this respect.

"Vessel ownership seems to go with interest in lines of business affiliated with water transportation. Cleveland's

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interest in the coal and iron business has led it to own vessels for carrying those commodities. Detroit, as the greatest passenger port on the lakes, has seen its capitalists lead in passenger boat ownership. Many lumber boats are owned in Chicago because of the pre-eminence of this city as a lumber market. Doubtless Chicago merchants would be investors in package freight boats were it not that the railroads monopolize that line of lake business. When the enlarged Erie canal is ready for use it would seem that Chicago merchants would invest in lake and canal boats intended to furnish through transportation service between this city and the seaboard.

"Aside from harbor improvement, about all the public can do to encourage home ownership of shipping is to provide more liberal tax laws and perhaps to enact incorporation laws designed to meet the needs of boat companies. At the present time boat companies in this state must organize under the general incorporation law, whereas the railroad companies are given a separate law.

TAXATION OF VESSEL PROPERTY.

"In Illinois boats are taxed as personal property. Minnesota and Indiana have laws providing that boat companies, in lieu of other taxes, shall pay annually 3 cents for each ton of its net registered tonnage. This tax is not only small in amount, but it has the merit of definiteness. While the Ohio tax laws are similar to those of Illinois, the vessel owners of Cleveland register their boats in the small Ohio ports that pursue the policy of assessing vessel property at a small proportion of its value.

"When Wisconsin changed its tax laws a few years ago, the Goodrich Co., an old Wisconsin corporation, re-organized under the laws of Maine and registered its vessels at the port of Duluth.

"There would seem to be no good reason for treating real estate that may be owned by a boat company different from other real estate. But the attempt to tax the vessels as personal property at their full value simply drives the owners to register them at other ports. The value of an attempt to introduce a more liberal tax system for boat companies, which probably would call for constitutional changes in this state, would be chiefly psychological, as tending to demonstrate the friendly attitude of the public mind toward the development of lake shipping. Under a more liberal tax system, the community would derive more revenue from shipping than it does at the present time, because now very few vessels register from this port, even when owned here. Even though the matter be not one of prime importance in itself, it should be the policy of Chicago to favor the registration of boats from this port."

ADDITIONAL INQUIRIES SUGGESTED.

Mr. Sikes closes his report with suggestions for more investigation into several lines of business which have close relation to Chicago's water-borne traffic, saying:

"There are three lines of inquiry closely related to the subject of harbor development, each of which calls for more thorough study than the harbor commission can give to it. The first is that of railroad terminals in Chicago; the second, the proper location for the fruit, vegetable and dairy produce business now centered in South Water street; the third has to do with the utilization of street cars for express and package business.

"The railroad terminals of Chicago are very badly arranged, and the facilities afforded are unsatisfactory. The problem is very difficult of solution and for that reason the subject is deserving of study by a body of experts that should give attention among other things to the need of better correlation of rail and water terminal facilities.

"The buildings in South Water street are antiquated and unsuited to the needs of the business carried on there. The quarters are cramped and modern facilities are lacking. Change of location is not likely to be brought about by private initiative. The subject is pre-eminently one calling for careful study by the public authorities, especially as the selection of a proper location must be made with reference to adequacy of transportation facilities, both rail and water.

"Chicago is behind many other cities with respect to the utilization of street cars for other than passenger purposes. This subject is intimately related to that of harbor development because, if a plan can be worked out for using street cars at night, and to some extent during non-rush hours of the day, for carrying express matter and packages, that service should prove valuable in connection with boat traffic. This development is certainly coming sooner or later, and it would seem to be the part of wisdom to determine by preliminary expert inquiry what is likely to be the best line of development for the public."

EARNINGS OF WOODEN SCHOONERS.

Data concerning the earning power of wooden schooners engaged in carrying coal on the Atlantic coast has just been compiled by the Bath *Times*, and will be found exceedingly interesting reading to vessel interests in general. These schooners leave Portland or Boston light and sail down the coast to one of the soft coal ports, returning with a load of coal. On the average a week is allowed for the trip each way, a week for loading and a week for unloading. Thus the round trip consumes about a month. The time consumed in loading and unloading will doubtless be read with wonder in the great lakes region, where a cargo of coal is put aboard in a few hours and taken out in a day.

Each trip is handled as an independent account, settlements being made at the end of each voyage. Thus, if the vessel has reasonable dispatch, 12 trips are made in the year, and the fortunate owner receives 12 checks. In the monthly statement every detail is accounted for. Following is the statement of one of the six-masters engaged in this trade:

STATEMENT NO. 8.

Schooner blank and owners in account with Blank & Co., Portland, Me.:

Baltimore in July, 1907:		
To telegram, 40c; towages, $381	$	381.40
To trimming 5,200 tons coal at 7c		364.00
To gratuity to trimmers, $1; stores, $48.53; water, $1.25		50.78
Boston in August, 1907:		
To crew's wages, 505; master's wages, July 1 to Aug. 1, 40	$	545.00
To master's primage on freight		286.00
To towages, $283; telephone, 65c		283.65
To stores and marketing, $161.43; chandlery, $14.07		175.50
To laundry, $1; shipping bill, $6		7.00
To annual dues to Atlantic Carriers' Association		62.64
To water, $10; commission on freight, $117		127.00
		$1,486.79
To dividend No. 8 among owners, Aug. 15, 1907		$2,304.00
To stamps, stationery and petties for same		5.00

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Balance due owners—carried to Statement No. 9.....	92.85
Total	$4,684.82

CREDIT.

By balance brought from statement No. 7	$ 84.82
By freight from Baltimore to Boston, on 5,200 tons coal at 90c	4,680.00
	$4,684.82

The individual items are quite interesting. The "gratuity to trimmers," invariably $1, is usually for a pail of beer. It will be noted that the master's wages are only $40 a month, but he gets a primage on freight which acts as an incentive to a speedy and careful voyage. It will be noted that his primage was $286. The master's annual earnings, making a fair subtraction for delays, are approximately $3,000. In addition, as the master usually has a small interest in the boat, probably one-sixty-fourth, he obtains a fair dividend as well. These schooners carry about 6,000 tons of coal, as against 10,000 or 12,000 tons carried in the largest of lake freighters.

The foregoing statement is based on a cargo of 5,200 tons of coal at 90 cents. This is a fair average rate for prosperous times, the rate occasionally being $1. During 1908, however, freight rates sagged from 90 cents to 75 cents and eventually dropped to 35 cents. There is practically no margin of profit at the latter rate, though at 90 cents the schooners make about 20 per cent on the investment.

WORK OF HYDROGRAPHIC OFFICE.

The hydrographic office has been investigating the causes of the strandings of vessels on the great lakes during the season of 1908, and attempting to determine how many of them were avoidable or remediable. Out of 217 cases reported the causes of 158 have been ascertained, and of those causes 92 or 58 per cent have been found avoidable or remediable. The remaining cases are being investigated and in a short time a complete list will be on hand.

A chart (H. O. 2649) is on file at the Cleveland branch hydrographic office on which are marked the approximate positions of all the strandings of the past year. All persons interested are cordially invited to call and examine same.

The hydrographic office has as one of the fundamental reasons for its existence the improvement of the safety of navigation. Its organic act provides "There shall be a hydrographic office for the improvement of the means for navigating safely the vessels of the navy and mercantile marine."

No worthier purpose could be served than to assist that distinctly American merchant marine which has in our time grown to such enormous proportions on the great lakes. It is the purpose of the hydrographic office and its branches by a study of the causes of accidents to reduce to a minimum those avoidable or remediable. The branch offices have in their possession information which, if it could be imparted to every officer on the lakes, would add immensely to the safety of navigation. The branch offices at Duluth, Chicago and Cleveland are thoroughly equipped to give all necessary instruction during office hours, while steps are being taken to put Buffalo on the same basis.

This is particularly true in regard to compass work. Ignorance of the compass, and the numerous causes of compass error leads, if not to grounding with resultant loss of life and property at least to unwarranted loss of time in making passages. The results of changing from a magnetic to a non-magnetic cargo and of the alteration of trim from light to loaded, and the effect of electric hoists in loading and unloading should all be known to officers of the vessels, such information can be had for the asking by coming to the branch hydrographic offices. The assistance of shipmasters, shipowners, managers of transportation lines and underwriters is earnestly requested in furtherance of the hydrographic office's purpose to improve existing conditions. The hydrographic office is laboring solely for the common benefit of all shipping interests and hopes that advantage will be taken of the facilities offered by the branch hydrographic offices for a thorough study of elementary navigation on the great lakes.

SHIP MASTERS' LODGE ELECTIONS.

Lodge No. 1, Buffalo, N. Y.: President, Capt. Peter Thompson; first vice president, Capt. W. H. Stevenson; second vice president, Capt. James G. Herbert; treasurer, Capt. John B. Hall; secretary, Capt. Charles McMillan; trustee for three years, Capt. John Perew; chaplain, Capt. Jerry Coleman, marshal, Capt. Dan Coughlin; warden, Capt. Harry Wanwick; sentinel, Capt. P. O'Neill; delegate to grand lodge, Capt. Peter Thompson; alternate, Capt. M. S. Peterson.

Lodge No. 2, Port Huron, Mich: President, Capt. H. Maitland; first vice president, Capt. F. W. Manual; second vice president, Capt. Guy Geel; treasurer, Capt. D. M. Sinclair; secretary, Capt. J. H. Sinclair; delegate to grand lodge, J. H. Sinclair.

Lodge No. 3, Chicago, Ill.: President, Capt. John K. Olsen; first vice president, Capt. S. Anderson; second vice president, Capt. Wm. T. Bright; treasurer, Capt. Wm. W. Shaw; secretary, Capt. F. B. Higgie; delegate to grand lodge, Capt. W. D. Hamilton; alternate, Capt. James O. Wood.

Lodge No. 4, Cleveland, O.: President, Capt. Robert Thompson; first vice president, Capt. Alex. Cragie; second vice president, Capt. John McGarry; secretary, Capt. J. A. Holmes; treasurer, Capt. F. L. Leckie; marshal, Capt. Charles H. Cleveland; warden, Capt. Martin Johnson; chaplain, Capt Harry T. Kelly; sentinel, Capt. A. LaLonde; delegate to grand lodge, Capt. Robert Thompson; alternate, Capt. F. L. Leckie.

Lodge No. 6, Milwaukee, Wis.: President, Capt. C. T. Bronson; vice president, Capt. H. M. Boyce; second vice president, Thomas Garrity; treasurer, Capt. F. C. Maxon; secretary, Capt John McSweeney; trustee, Capt. M. Dailey; delegate, Capt. James McGinn; alternate, Capt. C. T. Bronson.

Lodge No. 7, Detroit, Mich.: President, Capt. F. J. Simpson; first vice president, Capt. B. S. Baker; second vice president, Capt. Alex. Clark; treasurer, Capt. A. J. McKay; secretary, Capt. L. P. Anderhalt; chaplain, Capt. B. Armstrong; marshal, Capt. W. H. Hoffman; warden, Capt. C. Rattray; sentinel, Capt. J. C. Maddock; delegate to grand lodge, Capt. W. J. Crosby; alternate, Capt. W. H. Hoffman.

Lodge No. 8, Marine City, Mich.: President, Capt. J. H. McDonald; first vice president, Capt. Wm. Hagan; second vice president, Capt. J. A. Ward; treasurer, Capt. James Taylor; secretary, Capt. James E. Cottrell; chaplain, Capt. A. T. Broadbridge; marshal, Capt. S. B. McCann; warden, Capt. H. Brown; sentinel, Capt. John Atwell.

Lodge No. 9, Toledo, O.: President, Capt. A. W. Stalker; first vice president, Capt. R. N. Bailey; second vice president, Capt. N. M. Sullivan; secretary and treasurer, Capt. E. G. Ashley; delegate to grand lodge, Capt. James B. Lyons.

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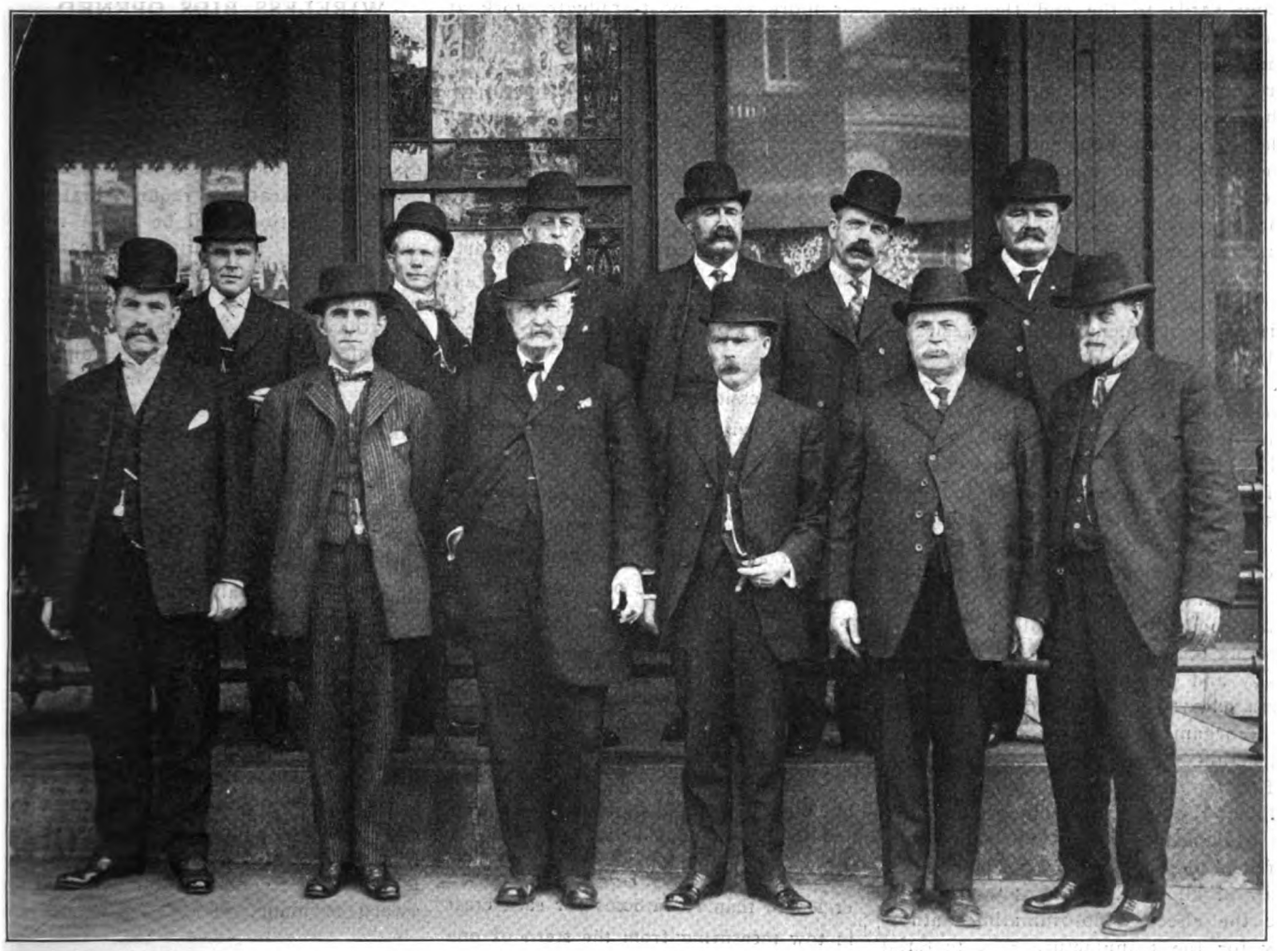

GRAND LODGE SHIP MASTERS ASSOCIATION SESSION AT WASHINGTON, D. C.

Front row, left to right:—1. A. J. McKay, Grand Treasurer. 2. J. H. Sinclair, Second Vice President. 3. James McGinn, Grand First Vice President. 4. J. H. McDonnald, Grand President. 5. E. G. Ashley, Grand Secretary.

Back row, left to right:—1. Robert Thompson, Grand Marshall. 2. James B. Lyons, Grand Chaplain. 3. C. E. Benham, Secretary Grand President. 4. Walter Hamilton, Delegate from Chicago Lodge. 5. Peter Thompson, Grand Warden. 6. William Crosby, Grand Sentinel.

LIGHTHOUSE TENDER FOR GEORGIAN BAY SERVICE.

A small, but interesting, twin-screw steamer which is being constructed at the Neptune works of Swan, Hunter & Wigham Richardson, Ltd., was launched on Thursday, the 21st ult. This vessel, the Simcoe, is being built to the order of the Canadian government, and is destined for use as a lighthouse tender and for buoy service in Georgian bay. For these purposes the steamer is equipped with appliances for lifting exceptionally heavy weights, including powerful winches and derricks. The vessel is also adapted for safe navigation amongst the ice, which she will frequently meet when on service.

The steamer is being fitted by the builders with twin screw, triple-expansion engines, which receive steam from two water-tube Babcock & Wilcox boilers.

The vessel is 180 ft. in length, by 35 ft. beam, built of steel, with poop and forecastle, the well between being adapted for the carriage of the larger buoys. The vessel is to be fitted with an installation for wireless telegraphy and has a Stone's underwater ash expeller. The accommodation, which has been specially designed for comfort in both hot and cold weather, will accommodate not only the officials directly connected with the ship, but also the Canadian government officials whose duty it may be to inspect the lighthouses, etc.

In addition to the ordinary equipment of boats, lifeboats, etc., a powerful steam launch is to be supplied.

The Canadian government were represented at the launch by Mr. Duguid and Mr. T. R. Ferguson, and the christening ceremony was gracefully performed by Mrs. G. F. Tweedy, of The Nook, Jesmond Park, Newcastle, wife of Mr. G. F. Tweedy, a director of Swan, Hunter & Wigham Richardson, Ltd.

REFORMS ANNOUNCED.

Mr. Truman H. Newberry, secretary of the navy, has just made public his plans for the reorganization of the navy department. These plans are the same which have recently received the approval of a conference of men who have at various times been prominent in the affairs of the navy and who were called together at the direction of President Roosevelt.

As has already been stated, the essential features contemplate the abolishment of the bureau system at the

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navy yards to the end that unnecessary work may be avoided and simpler methods of administration prevail; the enlargement of the general board of the navy and the reorganization of the board of construction, so that there may be more complete co-ordination in the work of the navy department and more general representation on these important boards.

To develop the usefulness and activities of the general board by rearranging its membership is desirable, Mr. Newberry says. He proposes that it consists of the admiral of the navy, the chief of the bureau of navigation, the president of the Naval War College, chief intelligence officer, one member of the board of inspection and survey, naval aid to the assistant secretary, and three of the most efficient line officers of the widest experience afloat. The members should be in practically daily consultation on all matters affecting the greater interests of the navy and personnel.

REORGANIZATION OF CONSTRUCTION BOARD.

Reorganization of the board of construction contemplates a membership of seven line officers and one staff officer, the chief naval constructor. It is to be charged with the supervision of the design, construction, and repair of all vessels, and is designed to be the effective co-ordinating authority for the manufacturing of material for the naval service.

The duties of the four constructing bureaus, viz., ordnance, equipment, steam engineering, and construction, will be re-assigned so that the detail drafting and manufacturing for the naval service will be done by the bureau of construction. The bureau of ordnance is to retain control and management of the gun factory, the torpedo station, the proving grounds, and magazines.

BUREAUS TO BE ABOLISHED

Ultimately the plan of reorganization contemplates the abolishment specifically of the bureaus of equipment, steam engineering, and yards and docks, their duties to be absorbed gradually by other bureaus. Steam engineering is to become a division of the bureau of navigation with a line officer at its head. This bureau, having lost its manufacturing features, will be charged with the determination of the type, location, etc., of propelling machinery and its inspection.

The secretary believes that in order to promote the efficiency of our ordnance work and steam and electrical enginering, a certain number of officers should be given an opportunity yearly to specialize in these classes by one or more years' post-graduate work at some suitable institution.

Part of the plan which the secretary outlines, he says, has been in effect since Jan. 1, and up to the present time there has not been received one word of criticism, suggestion, or protest. It appears to be working for the better military efficiency and proper business administration of the department.

NEW MARINE LAWS FOR 1909.

Commencing Jan. 1, a law passed at the last session of congress becomes effective, revising the passenger carrying act of 1882, which requires the isolation of the sexes in steerage apartments, more space for each passenger carried and an allotment for an entire passage of space for steerage passengers that is wholly unobstructed by the storage of cargo, stores or other goods. The act also governs the carrying of passengers on decks below the water line of the vessel.

Commencing Feb. 1, customs officers are instructed that it will be unlawful for the operators of steamers towing seagoing barges to use hawsers of greater length than 75 fathoms for each craft in tow measuring from the stern of one vessel to the bow of the following boat. It is further required that hawsers of less length must be used when the state of the weather and the seas will permit. It is also required that when two or more vessels are being towed that the tows be bunched whenever possible. A number of exceptions to the rule are made, information being furnished for the guidance of masters; but in no case do the exceptions cover water routes of the Pacific or tributary tide water bodies.

WIRELESS BIDS OPENED.

The navy department opened bids on Jan. 28, for the construction of a wireless tower in Washington, from which it shall be possible to communicate with ships at sea to the distance of 3,000 miles.

The specifications require that the tower or station shall be at all times capable of transmitting messages within a radius of 3,000 miles in any navigable direction from Washington and the messages are not to be interrupted by atmospheric disturbances or interference by neighboring stations. The department has also asked for bids for two sets of apparatus to be installed on naval vessels, to be capable of transmitting messages to and from a distance of 1,000 miles, and to receive messages from the Washington station at a distance of 3,000 miles at all times.

No less than seven firms submitted bids for the station, the most satisfactory of these probably being that of the National Electric Signalling Co., of Pittsburg, Pa., which offered to furnish the tower and apparatus for $182,000. However, there are features of some of the other bids submitted, which include ideas not mentioned in the specifications, which may receive consideration when the award is made.

SIX MONTHS' SHIP BUILDING.

The bureau of navigation reports 528 sail and steam vessels of 47,250 gross tons built in the United States and officially numbered during the six months ended Dec. 31, 1907, as follows:

	Wood				Steel				Total	
	Sail		Steam		Sail		Steam			
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Atlantic and Gulf	77	16,022	201	4,611	3	2,802	13	10,369	294	33,804
Porto Rico	4	42	...	.....	..	.....	..	.....	4	42
Pacific	7	61	84	7,424	..	.....	..	.....	91	7,485
Hawaii	..	.....	...	.....	..	.....	..	.....	...	.....
Great Lakes	..	.....	41	652	..	.....	10	2,987	51	3,639
Western Rivers	..	.....	85	2,133	..	.....	3	147	88	2,280
Total	88	16,125	411	14,820	3	2,802	26	13,503	528	27,250

During the corresponding six months ended Dec. 31, 1907, 575 sail and steam vessels of 259,974 gross tons were built in the Unitel States and officially numbered, as follows:

	Wood				Steel				Total	
	Sail		Steam		Sail		Steam			
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Atlantic and Gulf	65	17,319	171	6,203	1	63	34	53,167	271	76,752
Porto Rico	2	14	...	.....	..	.....	..	.....	2	14
Pacific	8	2,445	117	13,241	..	.....	3	11,201	128	26,887
Hawaii	..	.....	...	.....	..	.....	..	.....	...	.....
Great Lakes	4	52	46	2,267	..	.....	31	151,272	81	153,591
Western Rivers	..	.....	92	2,189	..	..	1	541	93	2,730
Total	79	19,830	426	23,900	1	63	69	216,181	575	259,974

	No.	Gross.
Total calendar year 1907	1,056	502,508
Total calendar year 1908	1,112	287,603
Loss		214,905

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PACIFIC COAST NOTES.

Office of the MARINE REVIEW,
302 Pioneer Bldg., Seattle, Wash., Jan. 30.

The old sailor's theory that wrecks always come by threes seems to be verified in the wreck of the American four-masted wooden schooner Soquel Jan. 22 on the southern shore of Vancouver Island, close to where the steamer Valencia was lost with 140 lives Jan. 22, 1906. The Soquel is the third vessel wrecked on the north Pacific coast within a few weeks, the other two, as previously reported in the MARINE REVIEW, being the steam schooner Sibyl Marston and the French ship Alice. The schooner was wrecked on a sunken ledge, which is a part of Seabird rocks at the mouth of Pachena bay. She was endeavoring to make her way up the straits from Callao, which port she left on Dec. 9 in ballast for Port Townsend. Wireless reports of the wreck were received soon after its occurrence and the British coasting steamers Tees and Lebro and the U. S. revenue cutter Manning went to the wreck and rescued the crew. The Soquel was in command of Capt. Charles Hennengsen. The only fatalities of the wreck were the death of Capt. Hennengsen's wife and child who were struck and instantly killed by falling spars at the time the schooner went aground. The Soquel is a four masted schooner built in 1901; she was 195 ft. long, 41 ft. beam, 765 gross tons and 693 net tons register and was owned by J. R. Hanify & Co., San Francisco.

The following vessels of the Pacific fleet of the U. S. navy have been assigned to the navy yard, Puget Sound, at Bremerton, Wash., for repairs: Cruisers Albany, Boston, Colorado, New Orleans, Pennsylvania, Tennessee, Washington, Concord, Princeton, Rainbow, Wheeling, battleship Oregon, collier Saturn, supply ship Supply and torpedo boats Goldsmith and Rowan. The cruisers California, Maryland, South Dakota and West Virginia will be docked at Puget Sound and afterwards go to Mare Island for repairs. The majority of these ships will come to this yard after the spring target practice at Magdalena bay, which will bring their arrival on Puget Sound some time in March. There is about a year's work in extensive repairs to be done on the Oregon. The Wheeling, Boston and Princeton will not need extensive repairs this season.

The Bamfield creek motor lifeboat belonging to the Canadian government which was recently wrecked on Robbers island and at first thought to be a total wreck has been rescued by the steamer Leebro and will be repaired. The repairs will be made at Victoria and it is expected that they will cost several thousand dollars.

John Hendry, a wealthy lumberman of British Columbia, will have the Vancouver Shipyards, Vancouver, B. C., build a $15,000, 70-ft. gasoline motor yacht. The new boat will be one of the finest pleasure craft on the north coast. Alfred J. C. Robertson of North Vancouver is the designer of the new boat.

About $5,000 is being spent in repairs to the U. S. revenue cutter Thetis. The work is being done by Hall Bros. Marine Railway & Shipbuilding Co., Winslow, Wash., and includes new decks, a new figure-head, cleaning, docking, painting, repairs to the propeller, etc. The work will be completed within a month.

The Willamette Iron & Steel Works, Portland, Ore. reports that good progress is being made on the new steel steamer H. B. Kennedy, which is being built for the Port Orchard route, Seattle. The installation of the machinery is nearing completion. The lower cabin is nearly finished and the framing for the upper cabin is all in place. It is expected to have steam in one of the boilers by the middle of February.

The four-masted schooner Ensign, bound from San Pedro, Cal., north in ballast went ashore Jan. 20 sixteen miles north of Santa Barbara and is being pounded to pieces by the sea. A line has been run ashore and the crew are in safety. It is feared the vessel will be a total loss. The schooner is 180 ft. long, 35 ft. beam and 13 ft. deep. She has a gross tonnage of 818 and a net of 522. She was built at Everett, Wash., in 1904 and is owned by Charles R. McCormick of San Francisco.

The British steamer Agapanthus, which has been lying disengaged since April 17 at Esquimalt, B. C., has been sold by John Bruce Murray & Co. of Glasgow to the Parke Steamship Co. of Glasgow. It is thought she will be used in the Mediterranean. When the Agapanthus was launched in 1892 she was the largest general cargo ship afloat.

The Boscowitz Steamship Co.'s steamer Venture burned to the water's edge at Inverness, B. C., Jan. 25. She had on board a cargo of 5,000 cases of salmon. The steamer will be a total loss with her cargo. The value of the Venture was about $100,000 and of the cargo $30,000, fully insured.

After braving many storms on its perilous voyage around Cape Horn, the lightship flotilla has arrived at San Francisco, 125 days out from New York. The little fleet made its voyage without a mishap. After minor repairs the ships will proceed to their various stations.

The contract for the repair of the steamer Senator has been let to Ferguson & Houston, Astoria, Ore., for $2,300.

The Port Orchard route is considering the construction of a new steamer for service out of Seattle on Puget Sound. The new boat is being designed by F. A. Ballin, Portland, architect for the steel steamer H. B. Kennedy, now under construction for the same route by the Willamette Iron & Steel Works, Portland. The new boat is to have a passenger capacity of 150 and a speed of 18 miles an hour. The Port Orchard route has also made arrangements to ferry freight cars from Seattle to the navy yard at Bremerton.

Congress will be asked at this session to provide more lights for the coast of Alaska. Insufficient aids to navigation along this coast are declared to be a menace to shipping. It is also noted that the Canadian waters are much better lighted than those belonging to the United Sates. The following additional lights are recommended:

Tongass Narrows—Hog rocks, Idaho rock, Spire island, near East Clump and Channel island, acetylene beacons; Lewis point, concrete beacon.

Port Chester—Gull rock, Ship island, acetylene beacons.

Wrangell Narrows—Point Alexander, Point Lockwood rock, Burnt Island ledge, Bush Top island, Boulder flat, South Green rock, North flat, Blunt point, Turn point, Mitkof island, acetylene beacons; South ledge, Danger point, concrete beacons; Midday islands, Portland island, Battery point, Rocky island, Tenakee inlet, acetylene beacons.

Peril Straits—Otstoi island, Rose Island rock, Middle Point rock, Sergius point, Channel islets, Wyville reef, acetylene beacons; Whitestone narrows, acetylene buoy.

Point Gardner—Murder cove, acetylene beacons.

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February 11, 1909.

A WARNING.

The sale of the Boston Steamship Co.'s liners Shawmut and Tremont, to the United States government, to be used as transports in the Panama canal service, marks the end of another disastrous attempt to operate a line of American steamers in the trans-Pacific trade in competition with foreign subsidized lines. For six years these splendid ships ran between Seattle and the principal ports of call in Japan, China and the Philippines. But it was a losing game and had to be given up.

The ships were not only left to fight out their existence without subsidy and with niggardly remuneration for their mail service, but even after they had secured a contract to carry government freight to the Philippines they were never given but a small fraction of the business because the quartermaster's department of the army gave steady preference to foreign built tramp steamships which were converted into transports and even went to the length of giving an occasional entire cargo to a foreign tramp. The quartermaster's department probably pursued this course on the grounds of economy. And such far-sighted economy it is that drives the American merchant ships—the *only* ones we can depend on in time of war or stress—from the Pacific ocean!

Japan is slowly and surely tightening her grip on the marvelous commerce of the orient and will be soon carrying all the freight to and from our own Philippines and Hawaii! Meanwhile we sit idly by and let our tonnage dwindle to nothing.

The owners of the American merchant vessels are loyal, patriotic citizens but they cannot battle with the enormous odds against them, and when, as in the case of the Shawmut and Tremont, they are not only denied government aid but are actually forced to compete with the government, there is nothing left to do but to quit.

Meanwhile the navy department continues to engage foreign ships to carry coal to the Pacific coast—the last fixture was made a week ago—on such terms as leave the foreigners free to prey on the remnant of American shipping left on the western ocean. The navy department says it cannot get American tonnage "at a reasonable price" for this service. But it at least could cease sending foreign bottoms to the Pacific to compete with American ships engaged in the general trade. All this on the grounds of economy! Is our government, with its billion dollar congresses, so poor that it cannot afford to protect its own shipping where it is most needed?

It is high time for America to wake up! Some fine day we will have a war, a real war with a first class power, and the people who think we do not need a merchant marine will learn a lesson they will never forget. It will be a lesson written in blood and its burden will be humiliation.

MARINE INSPECTION SERVICE BILL.

The commission appointed by President Roosevelt last May to examine the laws of the United States with a view to the better security of the lives of passengers and crews aboard vessels, have submitted their report to the president and it has now been transmitted to congress.

The commission consisted of Capt. Adolph Marix, chairman of the lighthouse board; Charles Earl, solicitor of the department of commerce and labor; Eugene Tyler Chamberlain, commissioner of navigation; George Uhler, supervising inspector general of the steamboat inspection service, and Commander Wm. Strother Smith of the United States navy.

The report of the commission is the result of extended inquiry. In order to put the matter upon an intelligent basis for congress to work upon, all acts which are now law and all necessary revisions, together with new matter, were embodied in the form of a bill divided into six articles. The salaries of the supervising inspectors are fixed at $3,000 per annum and in order to get the best possible men for local inspectors their salaries have been advanced to $2,500 per annum in the most important districts and $2,000 in other districts.

To relieve the inspectors of a great deal of work outside of the regular inspection of vessels, eight examining boards are to be created for the purpose of examining and licensing officers of the merchant marine and to try cases of misconduct. Under the present system such cases are first investigated and the trials are then conducted by the same officials.

It is proposed to make more vessels subject to inspection than at present, not only to insure their being properly constructed and equipped but also that they may have on board regularly licensed officers.

All steam vessels and all motor boats carrying passengers for hire are to be subject to inspection. Also all other steam and motor vessels of more than 35 ft. between perpendiculars. It was considered advisable to make the measurements by length rather than by ton-

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nage, this being a simpler and just as satisfactory method.

Instead of limiting the inspection of sail vessels to 700 gross tons or over, all sail vessels of 300 gross tons or over, and all sail vessels of 50 gross tons or over carrying passengers for hire, are to be included. All vessels are required to have on board the vessel a most efficient equipment for the safety of life at sea, including apparatus for fighting fire. It is required that all life boats shall be so fitted as to enable them to be launched in less than two minutes from the time the clearing away of the boats is begun, and the newest devices for stowing and clearing away will have to be installed on board all vessels. An efficient wireless telegraph apparatus is required on board of certain vessels together with a competent operator. Every vessel of any description carrying passengers must have at least one life preserver for each person on board.

Coming to the personnel on board the vessels it is stipulated that it will be unlawful for the master of a seagoing vessel to permit an officer to take charge of the deck watch immediately after leaving port who has not had at least four hours off duty before taking such watch. It is furthermore stipulated that steam vessels engaged in runs of more than 48 hours must have three licensed engineers and sufficient men in the engineers' force to stand three watches.

Every steam and motor vessel carrying passengers for hire, whether or not subject to inspection, must have in her service one licensed pilot and one licensed engineer, except that small open steam and motor boats need have only one person, who must be qualified to act in the dual capacity.

The bill is very sweeping in its provisions and is of the utmost importance, as it practically embraces all manner of craft, including motor boats. These provisions will be dealt with more fully in next week's REVIEW.

PIG IRON SITUATION.

The market continues slow, but despite lower prices and concessions, there is no evidence that action looking toward making lower quotations will be taken in the near future by the leading interests, since it is not generally believed that price reductions would stimulate business. However, leading manufacturers recognize that unless business conditions change soon for the better a general reduction in prices must be made. There is little confidence just now in improvement before midsummer, owing to the expected long drawn out tariff discussion. Some extremely low prices are being made on structural material, and railroads are taking only about 45 per cent of their normal rail tonnage. Pig iron production for January was 1,787,473 tons, showing an increase of slightly less than 4 per cent over December. Extreme dullness characterizes the pig iron market throughout the country and in the valleys there is a tendency toward lower quotations. There is still little activity in the coke market, and prices are irregular.

DULUTH-SUPERIOR COMMERCE.

Major Graham D. Fitch, corps of engineers, United States army, in charge of the harbors of Lake Superior, has just made public his report of the commerce of Duluth for the calendar year 1908.

Owing to the over supply of iron ore on docks at Lake Erie ports at the beginning of the season of navigation shipments from Duluth-Superior did not become general until July 1, and the consequent decrease in freight tonnage for these ports during the year 1908 was 31.59 per cent.

Hard coal shows a decrease of 128,202 tons under 1907, with a decrease in valuation amounting to $801,263. Soft coal shows a decrease of 1,103,274 tons under 1907, with a decrease in valuation of $3,061,025. Wheat and other grains show an increase of 3,963,879 bushels over 1907, with an increase in valuation of $4,029,481. Iron ore shows a decrease of 9,526,336 tons under 1907, with a decrease in valuation amounting to $28,388,890. Flour shows a decrease of 746,967 barrels under 1907, with a decrease in valuation of $2,018,874, and general merchandise shows a decrease of 62,092 tons with a valuation $18,777,520 under that of 1907. Lumber shows a decrease of 143,688,000 feet, the decrease in valuation being $3,287,798. The total number of passengers arriving and departing was 58,193.

The navigation season covered a period of 229 days. This is reckoned from the first departure or arrival to the last departure or arrival to or from the lower lakes. The open season for Duluth-Superior harbor, to and from Lake Superior ports only, was much longer, as some local boats ran all but two months of the year.

The first boat departing from the harbor for the lower lakes left on April 26, and the last departure for the lower lakes was made on Dec. 8. The first arrival from the lower lakes was on April 29 and the last on Dec. 10. The north shore boats were still running at the close of the calendar year.

The total receipts of cargo for Duluth and Superior combined totalled 6,594,915 tons with a value of $56,664,997, while shipments amounted to 17,202,247 tons, valued at $156,449,323.

Major Fitch's report is accompanied by a number of interesting photographs of improvements completed or under construction at Duluth-Superior during 1908. Among these are the new Northern Pacific railroad bridge, the rebuilt Interstate bridge, the Northern Cold Storage warehouse, the new Congdon dock at Duluth, as well as construction views of the work in progress at the Superior entry and the dredging of the Duluth harbor basin.

AROUND THE GREAT LAKES.

The steamer Montana has been sold by the United States marshal at Detroit under a claim for repairs and rebuilding. John R. Russel, treasurer of the Great Lakes Engineering Works, bid in the boat for $5,500.

Harry R. Rogers, general freight agent of the Cleveland & Buffalo Transit Co., has announced the appointment of Frank E. Carroll as freight agent at Cleveland. John H. Brown will be commercial agent of Cleveland instead of contracting agent.

The annual meeting of the Dominion Marine Association will be held in Ottawa on Thursday, Feb. 11. A committee from the Lake Carriers' Association will attend the meeting. The principal topic to be discussed will be the proposed change in the grain bill of lading.

The Detroit & Cleveland Navigation Co. has purchased the Detroit & Buffalo Steamboat Co., and hereafter both lines will be operated as one corporation. As is well known, the stockholders were practically the same in both companies. George Hendrie, former president of the Detroit & Buffalo Steamboat Co., becomes chairman of the board of directors of the consolidated companies. Philip H. McMillan retains the presidency of the Detroit & Cleveland Navigation Co., while Mr. A. A. Schantz remains as general manager. George M. Black, former secretary and treasurer of the Detroit & Cleveland Co., will continue in that capacity.

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Trials of the United States Scout Cruiser Chester*

BY CHARLES P. WETHERBEE, MEMBER.

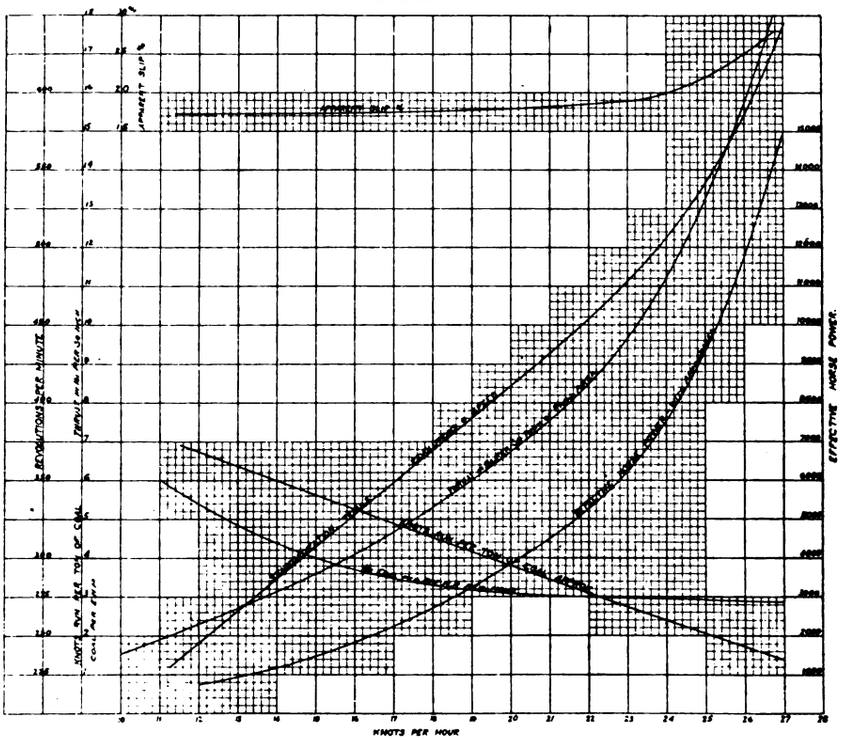
The Chester, built and engined by the Bath Iron Works, Ltd., Bath, Me., is of interest because the machinery equipment is of a type that is novel in the United States navy.

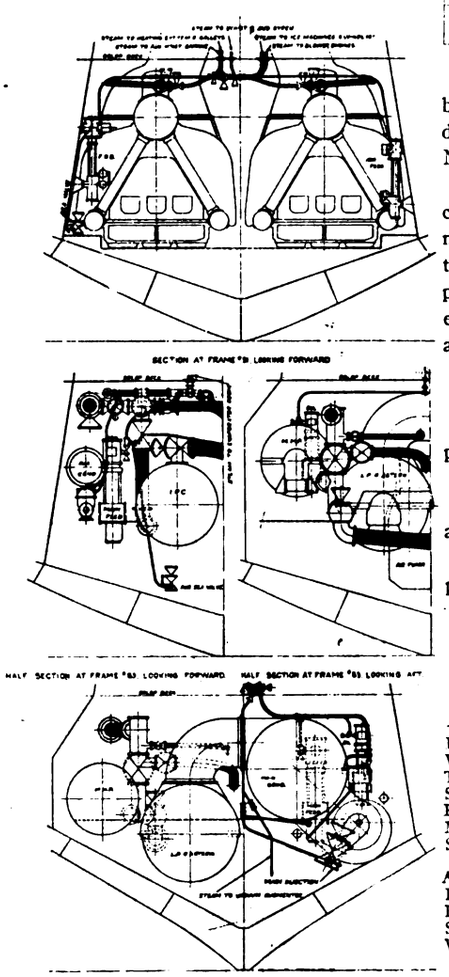
The hull was designed by the bureau of construction and repair of the navy department. The machinery was designed by the Bath Iron Works to fulfill a program outlined by the bureau of steam engineering and was built under the supervision of that bureau.

In the preparation of the machinery designs the Bath Iron Works were greatly aided by their correspondents, The Parsons Marine Steam Turbine Co., of Wallsend-on-Tyne, England, for the turbines, and their exclusive correspondents, Messrs. Augustin Normand & Co., of Havre, France, for the boilers. In fact, the boilers are among the last personally designed by the late Monsieur J. A. Normand.

*Read at the annual meeting of the Society of Naval Architects and Marine Engineers.

U.S.S. CHESTER





The general arrangement of machinery is shown on Plate 1. A summary of the leading engineering particulars and data observed on the four preliminary acceptance trials are given on Plate 2. The following curves are given on Plate 3:

Revolutions and speed.

Apparent slip per cent.

Thrust per square inch of projected propeller blade area.

Knots run per ton of coal.

Effective horsepower with appendages.

Pounds of coal per effective horsepower per hour.

A complete description of the ship, machinery and preliminary acceptance trials is given in an article by Lieut. A. F. H. Yates, United States navy, in the May, 1908, number of the Journal of the American Society of Naval Engineers.

Unfortunately the shaft horsepower was not measured on any of the trials as the torsion meters installed did not function properly.

The average effective horsepower derived from model experiments was 13,300 on the four-hour full-speed preliminary acceptance trial. The propulsive co-efficient at this speed, in the writer's opinion, is about 0.55.

The machinery weights are as follows:

	Tons.	Tons.	Lbs. per I. H. P. Lbs. per E.H.P.	Lbs. per I. H. P. assuming 0.55 propulsive co-efficient.
Boilers complete with all mountings including stop-valves	229.88	269.88	45.5	25.0
Water in boilers to steaming level	40.00	.....	....	....
Turbines complete	.....	157.75	26.6	14.6
Shafting and bearings	49.15	.....	....	....
Propellers	7.96	.....	....	....
Main condensers including augmentors	41.21	.....	....	....
Steam and exhaust, suction and discharge piping, including all valves, fittings, hangers and lagging	73.12	370.16	62.4	34.4
Auxiliaries	46.77	.....	....	....
Fittings, gear, tools, spares, steam heat, etc	63.06	.....	....	....
Floors, ladders and gratings	13.14	.....	....	....
Smoke pipes and uptakes	52.75	.....	....	....
Water, except in boilers	23.00	.....	....	....
Total	.....	797.79	134.5	74.0

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OFFICIAL STANDARDIZATION TRIALS, CON.

NO. OF RUN			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
REVOLUTIONS OR DOUBLE STROKES PER MINUTE — MAIN TURBINES	STAR	#1	233.80	231.10	233.02	295.09	299.57	297.55	551.67	548.00	552.37	544.73	548.90	546.41	547.65	467.59	389.46	385.66	387.61
	SHAFTS	#2	272.76	268.85	271.18	340.99	342.70	342.95	537.23	537.57	539.29	548.11	543.56	546.88	473.49	471.76	350.16	387.41	387.35
	PORT	#3	267.73	266.35	266.82	337.02	339.93	340.13	539.21	536.48	542.51	545.45	542.66	534.24	533.36	531.06	442.24	440.52	441.48
	SHAFTS	#4	233.15	229.16	233.26	295.04	297.67	298.01	552.11	547.65	552.55	545.05	548.36	463.58	467.53	466.85	387.36	387.37	386.57
	AVERAGE FOR BOTH SIDES		251.87	248.90	251.07	317.03	319.97	319.65	545.05	542.42	546.46	545.83	545.87	482.68	486.54	484.34	402.36	400.24	400.95
REVOLUTIONS OR DOUBLE STROKES PER MINUTE — ENGINE AUXILIARIES	MAIN AIR	F	21	21	22	21	20	19	20	22	21	20	21	23	21	21	21	21	20
	PUMP	A	22	22	22	20	20	20	19	20	21	20	20	20	20	20	20	21	21
	MAIN CIR	F	150	148	154	155	156	156	194	208	197	198	168	183	188	186	186	174	180
	PUMP	A	130	130	133	122	131	133	130	145	146	135	140	135	140	139	145	137	133
	MAIN	F	15	17	14	19	17	21	33	32	31	30	29	24	23	24	21	19	21
	FEED	A	0	0	0	3	3	3	25	30	28	28	38	26	29	24	19	19	24
REVOLUTIONS OR DOUBLE STROKES PER MINUTE — OTHER AUXILIARIES	SANITARY		24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
	OIL PUMP		14	14	14	15	15	16	16	16	29	21	19	19	18	31	27	23	22
	DYN ENG		400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
	BLOW	#1	84	84	84	84	60	60	400	350	300	300	310	220	220	220	220	220	240
	TO BLOWERS	" #2	58	58	58	75	75	75	360	350	260	310	310	260	225	280	250	220	240
		" #3	78	76	76	76	76	76	325	325	325	300	310	260	220	220	220	210	220
	AVERAGE FOR BLOWERS		73.3	72.6	72.6	78.3	70.3	70.3	361.6	341.6	295	303.3	310	246.6	221.6	240	230	216.6	233.3
PRESSURES — ENGINE ROOMS	MAIN G	F		231	239	237	232	237	209	236	235	232	223	237	237	232	242	237	237
	STEAM	A	240	240	245	240	235	235	210	240	236	236	236	245	242	238	245	240	237
	MAIN H P	F		9	7	24	24	24	171	171	170	167	165	100	105	105	61	57	57
	TURB G	A	5	5	7.5	4	4	4	175	173	176	170	163	100	100	100	55	56	57
	L P	F		3	3	5	5	5	19	20	20	22	21	15	15	15	10	10	105
	TURB AB	A	3	3	3	5	5	5	21.5	20.3	20.5	21.6	21.3	15.0	15.0	15.0	9.5	9.5	9.5
	H P C G			80	80	144	144	144											
	I P C AB			36	35	61	63	63						204	202	202	123	123	123
	AUX G	F		231	239	237	232	232	209	236	235	232	223	237	237	232	242	237	237
	STEAM	A	245	245	243	245	240	220	245	240	245	245	242	245	240	245	245	245	235
	AUX	F		15	7	3	6.5	6	5	3	2	8	2	2	7	3	11	12	7
	EXH G	A	8	8	7	6	9	5	6	7	6	11	10	11	11	6	13	12	10
	OIL	F		.5	.5	.25	.25	25	1	1.5	2	2	1.5	2	3	2	2.5	1.7	1.5
	G	A	7	7	8	6	6.5	8	7	7	7	7	7	7	7	7	7.5	7.5	7.5
	ST TO G	F		1.5	1	1	.25	.25	1	5	1	.5	0	.5	.5	1	2	1	1.8
	GLANDS	A	15	15	14	13	14	14	14	15	15	15	15	15	15	15	16	16	14
	ST TO FEED HEATER	F		15	7	3	6.5	6	5	3	2	8	2	2	7	3	11	12	7
	VACUUM	F		29.2	29.2	29.2	29.2	29.2	29.1	29.1	29.1	29.1	29.1	29.7	29.7	29.7	29.7	29.8	29.8
	(HG)	* A	29	29.1	29.3	29.4	29.5	29.5	28.9	28.7	28.8	28.7	28.8	29.4	29.4	29.6	29.6	29.6	28.6
	BAROMETER		29.78	29.78	29.78	29.78	29.78	29.78	29.78	29.79	29.79	29.79	29.79	29.79	29.79	29.80	29.80	29.80	29.80
PRESSURES — BOILER ROOMS GAUGE PRESSURES	BOILER A		235	230	235	240	240	240	215	240	245	240	245	245	248	240	248	210	170
	" B		240	235	240	240	235	240	212	245	250	245	250	250	253	245	253	220	150
	" C		240	236	240	244	235	240	215	245	245	245	245	245	240	250	240	220	
	" D		240	236	240	242	235	240	212	246	245	245	250	247	245	242	250	240	185
	" E		235	235	240	240	227	235	215	244	240	240	240	241	240	235	246	245	240
	" F		240	240	245	245	232	240	217	248	246	245	246	246	245	241	250	248	244
	" G		235	235	240	240	230	235	216	247	240	238	241	240	242	236	248	246	240
	" H		240	240	245	245	233	240	219	250	245	241	246	245	248	241	252	249	245
	" J		240	245	245	245	235	240	210	245	245	240	245	245	245	240	250	245	240
	" K		240	240	245	240	235	235	210	240	240	245	240	235	240	235	245	245	235
	" L		235	240	235	240	230	235	205	235	235	235	235	235	235	235	245	240	235
	" M		240	245	245	245	240	240	210	240	240	240	240	240	240	240	250	245	240
	AVERAGE		238.3	238	241.2	242.1	234	238.3	213	243.7	243	241.6	243.6	243	243.8	239.1	249	239.4	220.8
AIR PRESS. IN EXCESS OF WATER PRESS. — BOILER ROOMS	#1 FIREROOM		.0	.5	.0	.0	.0	.0	3.5	3.5	3.0	2.5	2.5	2.25	2.0	1.5	1.0	.5	1.0
	" #2 "		0	.0	.0	.0	.0	.0	2.25	2.5	1.25	1.5	1.75	1.25	1.0	1.25	1.0	9	1.0
	" #3 "		.0	.0	0	.0	.0	.0	1.75	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0
	AVERAGE		.0	.16	0	.0	.0	.0	2.5	2.66	2.08	2.0	2.08	1.83	1.33	1.25	1.0	.8	1.0
TEMPERATURES — ENGINE ROOMS	INJ-	F		31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
	ECTION	A	30	30	30	30	30	30	30	31	31	31	31	31	31	31	30	30	30
	DIS-	F		35	36	37	40	35	53	49	54	55	53	46	47	45	40	42	40
	CHARGE	A	40	40	39	42	41	41	78	72	73	77	76	58	60	58	50	51	50
	AIR PUMP	F		61	60	59	52	56	57	64	70	66	66	66	64	60	58	56	61
	DISCHGE	A	72	72	70	65	64	64	90	79	80	84	92	72	69	74	70	66	68
	FEED TO	F		59	59	59	56	56	57	64	64	64	58	57	60	60	57	54	56
	HEATER	A	82	84	82	78	74	72	86	80	84	81	92	70	76	74	76	70	72
	FEED FR	F		198	209	180	218	186	192	191	188	174	210	209	224	202	220	202	215
	HEATER	A	94	94	94	94	94	94	176	190	190	194	200	112	200	154	204	212	156
	ENG RM	A	72	72	67	67	64	64	64	68	68	69	67	71	70	70	72	74	74
TEMPERATURES — FIREROOMS	#1 FIREROOM		58	56	56	56	54	56	52	52	52	50	52	50	52	53	56	54	54
	" #2 "		58	58	57	55	56	59	60	57	57	56	56	54	58	59	62	59	58
	" #3 "		52	52	52	52	52	52	50	50	48	48	48	48	48	48	48	56	58
	AVERAGE		56	55.3	55	54.3	54	55.6	54	53	52.3	51.3	52	50.6	52.6	53.3	55.1	56.3	56.6
TEMPERATURES — BOILER ROOMS GAUGE PRESSURES	#1 PYROM R		460	500	510	525	525	520	735	700	720	735	740	640	670	680	600	340	
	#2 PYRO R		420	445	450	460	460	450	730	690	730	690	690	560	680	590	530	480	
	AVERAGE		440	472.5	480	492.5	492.5	485	732.5	695	725	712.5	715	600	635	635	565	410	

NOTES FOR OFFICIAL TRIALS.

* ALL GAUGE PRESSURES EXCEPT VACUUM CORRECTED
@ BAROMETER READINGS FROM ANEROID BAROMETER ON DECK
G = GAUGE PRESSURES - AB = ABSOLUTE PRESSURES
SHAFTS ARE NUMBERED IN REGULAR ORDER FROM STARB. OUTB'D (#1) TO PORT OUTBD(#4)
HEIGHT OF PYROMETER ABOVE GRATE APPROXIMATE 38 FT.

OFFICIAL FOUR HOUR TRIAL

COURSE OFF ATLANTIC COAST, MARCH 1, 1908. SPEED 26.522 KNOTS.
DRAFT, MEAN, 16' 6" TRIM 8" BY STERN. DISPLACEMENT, MEAN 5673 TONS.
MODERATE W.N.W. WIND, SMOOTH SEA. COURSE (COMPASS) S.S.W. ¾ W. N.N.E. ¾ E.
POCAHONTAS COAL, HAND PICKED. POUNDS OF COAL PER HOUR — #1 FIRE ROOM 12628. — #2 FIRE ROOM 12264 — #3 FIRE ROOM 13440 — TOTAL 38332.
KNOTS PER TON OF COAL 1.55. POUNDS OF COAL PER SQ. FT. OF GRATE SURFACE 55.08
SLIP OF PROPELLERS IN PER CENT OF THIER OWN SPEED, BASED ON MEAN PITCH — #1 STARB'D 25.71 — #2 STARB'D 25.99 — #3 PORT 26.18 — #4 PORT 24.34 — MEAN SLIP 25.56. SLIP (IN %) = 100 [(P × R) − (S × 181.33) / (P × R)]
IN KNOTS. P = PITCH OF PROPELLER IN FEET. R = REVOLUTIONS PER MINUTE. S = SPEED OF SHIP

OBSERVATION		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	AVE	
REVOLUTIONS OR DOUBLE STROKES PER MINUTE — MAIN TURBS	STAR.	#1	616.7	617.4	611.8	618.6	619.3	615.0	616.1	610.1	611.4	610.7	617.5	619.4	618.5	618.9	613.4	614.8	615.52	
	SHFTS	#2	625.0	625.5	625.8	618.8	619.8	617.7	617.0	616.4	611.5	611.2	620.5	622.7	619.1	618.4	617.5	612.7	617.85	6453.
	PORT	#3	621.0	621.4	621.3	620.0	623.2	623.4	620.4	620.0	619.2	620.1	618.0	624.2	624.4	624.6	613.4	616.0	620.5	TOTAL H.P.
	SHFTS	#4	609.3	605.0	610.0	605.1	605.1	602.6	607.2	604.2	602.4	600.4	593.7	605.4	607.7	608.9	605.5	604.7	605.8	604.5
REVOLUTIONS OR DOUBLE STROKES PER MINUTE — ENG AUXILIARIES	MN AIR	F	27		26		26		25		25		25		26		26		25	26	26
	PUMPS	A	24		26		27		25		24		23		24		23		23	24	24
	MAIN	F	192		200		204		205		202		202		202		202		202	201	86
	CIRC	A	164		168		172		174		169		166		175		171		173	170	86
	MAIN	F	43		47		49		47		49		47		42		46		47	46	50
	FEED	A	40		47		53		56		58		57		58		56		62	54	55
REVOLUTIONS OR DOUBLE STROKES PER MINUTE — OTHER AUXILIARIES	SANITARY		24		24		24		24		24		24		24		24		24	24	3
	OIL		18		23		22		21		23		21		23		25		22	22	2
	DYN. ENG.		400		400		400		400		400		400		400		400		400	400	66
	BLOW TO BLOWERS	#1	400		350		300		310		310		350		330		340		350		350
		" #2	400		370		320		345		330		350		350		355		360		360
		" #3	430		370		340		345		350		350		350		340		350		180
	AVER'E		410		363		320		333		330		350		343		345		353		235
	STEER. ENG																				4
TOTAL H.P FOR ALL AUXILIARIES																					563
PRESSURES — ENGINE ROOMS	MAIN G	F	245	241	241	245	246	247	245	247	235	235	240	245	245	245	245	240	234	242	
	STEAM	A	250	252	240	245	246	250	249	240	235	237	250	248	249	248	243	247		246	
	M H.P.	F	235	235	227	240	237	240	240	240	234	230	235	240	240	240	238	238	225	237	
	TURB. G	A	245	245	235	233	240	244	242	237	234	232	243	242	245	240	236	242		240	
	L.P. AB.	F	30	30.5	30	30	30.5	31	31	30	30	29.5	30	31	30.5	30	30	30	28.5	30.2	
	TUR.	A	32	31.5	26	30.2	30.4	31.1	30.5	29.3	29.2	29.2	29.2	31.1	30.8	29.8	29	28.3	29.2	29.9	
	H.P.C.-G		20"V	20"V	20"V	20"V	20"V	20"V	20"V	20"V	20"V	20"V	20"V	20"V	20"V	20"V	20"V	20"V	20"V	20"V	
	I.P.C.-AB.		6.5	7.0	7.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	5.0	5.0	5.0	5.0	6.0	5.5	5.0	6.6	
	AUX. G	F	250	255	240	250	250	250	249	250	240	240	241	246	250	250	250	249	238	247	
	STEAM	A	250	252	240	250	250	250	252	243	248	242	252	252	250	250	248	250		248.7	
	AUX G	F	17	16	15	15	15	16	14	13	14	14	14	16	15	15	13	14	14	14.7	
	EXH.	A	20	21	18	18	19	19	19	17	18	17	19	18	18	17	16	17		18	
	OIL	F	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2.5	2.5	2.5	2.5	2.5	2	2	2	2	
	G	A	6.5	6.6	6	6	6	6	6	7	7	7	7	7.5	7.5	7	7	7		6.7	
	ST TO G	F	.5	.5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	GLANDS	A	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	.5				
	ST IN G	F	17	16	15	15	15	16	14	13	14	14	14	16	15	15	13	14	14	14.7	
	HEATER	A																			
	VACUUM	F	28.9	28.8	28.9	28.8	28.9	28.9	29	29	29	28.8	28.9	28.8	28.9	28.8	29	29	29	28.9	
	(HG)	* A	28.2	28.4	28.4	28.2	28.2	28.2	28.2	28.2	28.3	28.3	28.2	28.2	28.2	28.2	28.3	28.3	28.4	28.8	
	BARO'R	@	30.42	30.45	30.45	30.44	30.44	30.45	30.45	30.46	30.47	30.47	30.48	30.49	30.50	30.50	30.51	30.52	30.53	30.46	
PRESSURES — BOILER ROOMS GAUGE PRESSURES	BOILER A		255		260		260		260		262		257		260		260		245		
	" B		255		260		260		265		265		260		268		260		245		
	" C		252		258		257		260		262		260		260		260		247		
	" D		250		260		256		267		260		255		260		258		245		
	" E		245		250		251		250		255		250		255		250		250		
	" F		250		255		256		255		260		255		260		255		255		
	" G		245		250		250		249		255		250		255		250		250		
	" H		250		255		255		254		260		255		260		255		255		
	" J		250		250		255		255		250		255		255		255		245		
	" K		250		250		250		255		245		250		255		250		240		
	" L		250		245		250		255		245		250		250		250		235		
	" M		250		250		255		255		250		250		255		255		240		
	AVER'E		250		253		254		256		255		254		257		253		246	254	
AIR PRESS. IN EXCESS OF WATER PRESS. — BOILER ROOMS	#1 F'RM		3.0		2.4		2.4		2.4		2.2		2.8		2.5		2.6		2.8		
	" #2 "		3.5		3.0		2.5		2.5		2.75		2.8		3.0		3.0		3.0		
	" #3 "		2.5		3.0		3.0		3.0		3.0		3.0		2.6		2.5		2.5		
	AVER'E		3.0		2.8		2.63		2.63		2.65		2.86		2.7		2.7		2.76	2.75	
TEMPERATURES — ENGINE ROOMS	INJ-	F	36	36	38	38	38	38	38	38	37	38	34	38	38	38	37	37	38	37.6	
	ECTION	A	34	34	37	37	38	38	37	37	36	37	37	37	37	37	36	36		36.6	
	DIS-	F	81	72	74	76	74	76	70	71	73	72	72	71	73	73	70	71	72	73.0	
	CHARGE	A	84	84	86	84	84	84	82	82	82	83	85	85	84	85	82	82		83.6	
	AIR PMP	F	78	78	81	84	80	81	78	79	80	80	80	80	79	81	80	80	81	80	
	DISCH.	A	100	99	98	96	96	96	94	90	92	97	96	96	97	96	97	96		96	
	FEED TO	F	73	73	80	80	80	80	76	76	78	80	80	80	79	73	79	79	80	78.2	
	HEATER	A	98	100	98	96	96	96	94	92	94	96	97	98	94	96	93	92		96	
	FEED FR	F	224	218	232	226	224	228	220	220	220	211	230	222	220	226	224	218	222	226	226
	HEATER	A	190	190	189	198	208	200	200	204	204	205	200	225	220	220	223	220		206	
	ENGINE	F	50	50	50	52	50	51	50	51	51	51	52	51	52	54	54	54	54	51.5	
	ROOM	A	68	64	59	60	58	58	56	55	56	56	55	56	60	60	60	60		59	
TEMPERATURES — FIREROOMS	#1 F'R'M		40		48		40		42		42		44		46		38				
	" #2 "		44		46		48		49		48		46		46		46		45		
	" #3 "		34		34		38		38		34		36		38		38		40		
	AVERAGE		39.3		42.6		42		43		41.3		42		43.3		47.3		42.5	42.6	
TEMPERATURES — BOILER ROOMS GAUGE PRESSURES	#1 PYRO'R		650		760		800		830		840		910		900		880		980		
	" #2 "		760		720		780		800		860		900		910		920		880		
	AVERAGE		805		740		790		815		860		906		905		900		930	848	

TEMPERATURE OUTSIDE AIR 82.

The results of the preliminary acceptance trials are completely summarized on Plate 2. Particular attention is called to the four-hour full-speed trial. The writer considers himself safe in making the statement that such results would be impossible with reciprocating engines.

Although the machinery developed about 50 per cent more than the designed power on this trial, it was not pushed to its limit in any part except the feed system. The feed pumps and their connecting piping reached their capacity limit at the power developed on this trial, so that the rate of combustion in the boilers was simply regulated to evaporate all the

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water that the feed system could supply. The boilers, therefore, were not forced, and the air pressure was only 2.75 inches, where the fan equipment can readily maintain 4 inches. Another feed pump with its piping has been added since the ship was delivered to the government.

The final acceptance trials of the ship took place on October 20 and 21, 1908, in a heavy northeast gale, with the following results:

Duration, hours	12	4
Displacement, tons	3800	3630
Mean revolutions per minute	479.6	590.1
Corresponding speed, knots.	23	26.1
Miles per ton of coal.....	2.3	1.5
Average air pressure, inches	0.75	2.75
Coal per E. H. P. per hours, pounds	3.61	3.23
Coal per I. H. P. per hour on basis of 0.55 propulsive coefficient	1.97	1.78

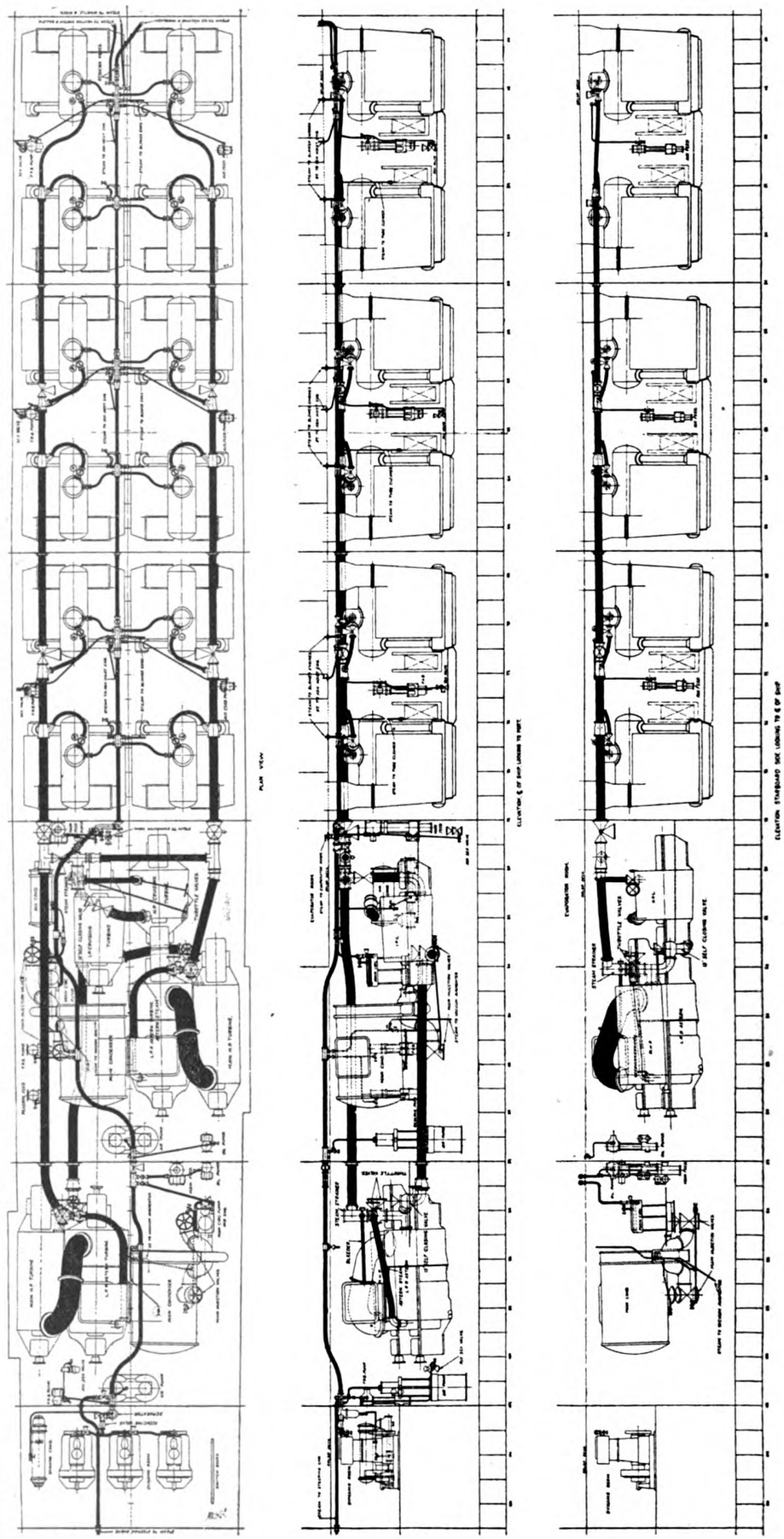
On these trials in a very rough sea the turbines did not race. This is a very valuable feature in connection with turbine machinery. The ship was operated on these final acceptance trials by her regular navy crew under service conditions. The coal was ordinary run of mine taken from the government pile at the Boston navy yard. The air pressures carried were, by direction of the board, regulated to be the same as the corresponding preliminary acceptance trials.

The small difference between the above results and those obtained by the contractors on the preliminary acceptance trials is remarkable, when the quality of the coal and the condition of the sea are considered.

The conclusion drawn by the writer from the trials of this ship is that the combination of bent tube boilers with rugged scantlings, or of other boilers capable of a high rate of forcing and evaporation per unit of heating surface, combined with steam turbines, permits a lightness of machinery installation without any sacrifice of durability and reliability never before contemplated in our war ships designs.

Light machinery installations have been constructed in the past for torpedo boats and destroyers, but through the use of short-life boilers of very light scantlings and delicate parts in the main engines and auxiliaries, durability and reliability have been sacrificed.

The machinery of the Chester is not of this class. Lightness per unit of power is obtained through thermodynamic efficiency and high output per unit of surface. The boilers are of rugged design and have large, thick tubes. Their casings are heavy and durable. After 14,000 miles of steaming one small part of the casing



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HULL.

BUILT BY THE BATH IRON WORKS, BATH, MAINE – MAY 4, 1905 TO APRIL 24, 1908.
MATERIAL, STEEL

DRAFT, DESIGNED TRIAL	FORWARD 16′ 9½″ / AFT	MEAN TRIAL DRAFT 16′ 6″ VESSEL TRIMMED 8″ BY STERN.	
DISPLACEMENT ON ABOVE DRAFT	(16′ 9½″)		5775 TONS
DISPLACEMENT PER INCH AT L.W.L.	(5775 TONS DISPLACEMENT)		311 TONS
LENGTH BTN PERPENDICULARS 420′-0″	AREA IMMERSED ⊠		565 SQ FT
LENGTH OVER ALL 423′-4½″	AREA L.W.L. PLANE		13070 SQ FT
LENGTH ON L.W.L. 420′-0″	WETTED SURFACE		22250 SQ FT
BEAM, EXTREME 47′-8″	COEFFICIENT OF FINENESS, BLOCK.		.59
BEAM ON L.W.L. 46′-11½″	COEFFICIENT OF FINENESS ⊠		.73
BEAM, MOULDED 46′-8½″	COEFFICIENT OF FINENESS, L.W.L.		.66
CAPACITY OF COAL BUNKERS (435 CUBIC FT = 1 TON)			1393 TONS
CAPACITY OF ENGINE ROOM FEED TANKS (3014 GALS)			1116 TONS
CAPACITY OF RESERVE FEED WATER COMPARTMENTS			1145 TONS

TURBINE CYLINDERS.

SIX PARSONS MARINE STEAM TURBINES ON FOUR SHAFTS
THE ASTERN TURBINES ARE IN AFTER PORTION OF MAIN L.P. CYLINDERS.

CYLINDER	DIA OF CASING	DIA OF DRUM	DIA OF CYL FOR EACH STAGE 1	2	3	4	5	6	7	ROWS OF BLADES—EACH STAGE 1	2	3	4	5	6	7
H.P. CRUISING	60″	36″	60½	61″	61¼	–	–	–	–	12	12	12	–	–	–	–
I.P. CRUISING	49	60½	51⅛	51⅞	52⅝	–	–	–	–	15	15	15	–	–	–	–
MAIN H.P. PORT	42	103¼	43⅜	44⅛	45⅛	47	49	52	–	12	12	12	12	12	10	–
MAIN H.P. STAR.	—	—	—	—	DO.	—	—	—	—	—	—	—	DO.	—	—	—
MAIN L.P. PORT	65	53½	70	72	75	79	79	79	79	5	5	4	3	3	4	4
MAIN L.P. STAR.	—	—	—	—	DO.	—	—	—	—	—	—	—	DO.	—	—	—
ASTERN PORT	50	43	51	52	54	54	54	–	–	6	6	6	6	6	–	–
ASTERN STAR.	—	—	—	—	DO.	—	—	—	—	—	—	—	DO.	—	—	—

CALIBRATION.

SHAFT	OUTBOARD STARB'D	OUTBOARD PORT	INBOARD STARB'D	INBOARD PORT
LENGTH OF SHAFT CALIBRATED	24′-0″	24′-0″	36′-0″	36′-0″
RADIUS ON WHICH CALIBRATED	30″	30″	30″	30″
CALIBRATION CONSTANT	.11085	.1096	.1631	.16315

THIS CONSTANT REPRESENTS THE MEAN TWIST, ON A 30″ RADIUS, FOR EACH 1000 POUNDS APPLIED THROUGH A 5 FT LEVER.

HORSE POWER CONSTANTS.

SHAFT	OUTBOARD STARB'D	OUTBOARD PORT	INBOARD STARB'D	INBOARD PORT
DISTANCE BETWEEN INDUCTOR WHEELS	24′-0″	24′-0″	36′-0″	36′-0″
RADIUS ON WHICH TORSION METER READS	12.5″	12.5″	12.5″	12.5″
*HORSE POWER CONSTANT	20.62	20.95	14.01	14.01

* THIS CONSTANT REPRESENTS $\frac{5255}{33000}$ OR C IN THE FORMULA $\frac{T \times R \times C}{33000} = B.H.P.$
WHERE · T · TORSION METER READING IN INCHES – R · REVOLUTIONS PER MINUTE
5255 · FOOT POUNDS CORRESPONDING TO 1″ READING ON TORSION METER · 5255 IS A TORSION METER CONSTANT – HENCE · T × R × C = BRAKE HORSEPOWER

SHAFTING AND BEARINGS.

THRUST SHAFT ON SPINDLE ENDS.
SOLID LINE SHAFT, 8″ DIA., CLASS "A" STEEL
SOLID STERN TUBE SHAFT / SOLID PROPELLER SHAFT — ONE PIECE 8½″ DIA. INBOARD SHAFTS 48′-3″ OUTBOARD SHAFTS 46′-5⅛″
TWO TURBINE SHAFT BEARINGS TO EACH TURBINE — TOTAL 12

TURBINE SHAFT BEARINGS – LENGTH	FORD H.P. & I.P. CRUISING	10′
	AFTER · · ·	10′
	FORD MAIN H.P. & L.P.	15′
	AFTER · · ·	15′

COLLARS ON THRUST SHAFT	H.P. & I.P. CRUISING	MAIN H.P. & L.P.
NUMBER	8	15
THICKNESS	5/8″	1″
SPACE BETWEEN	11/16″	11/16″
OUTSIDE DIA.	10″	12½″
INSIDE DIA.	6″	8½″
BEARING SURFACE FORD SIDE	362.88 SQ IN.	886.5 SQ IN
NO OF THRUST RINGS	8	15
EFFECTIVE THRUST RING SURFACE FORD SIDE	313 SQ IN.	796 SQ IN
NO OF LINE SHAFT BEARINGS	15	LENGTH 12″
LENGTH OF STERN TUBE BEARINGS FORD BEARING 51½″ AFT BEARING 51½″		
LENGTH OF PROPELLER SHAFT BEARINGS	51½″	

CONDENSERS AND FEED HEATERS.

	NUMBER — TYPE — AND LOCATION.	TUBES NO	B.W.G	O.D.	LENGTH	COOLING SURFACE EACH	COOLING SURFACE TOTAL
MAIN CONDENSERS	ONE – CYLINDRICAL – EACH ENG ROOM	5630	#18	¾″	10′-2½″	8903	7006
AUX CONDENSER	ONE – CYLINDRICAL · FORD ENG ROOM	630	#18	¾″	6′-0⅞″	601	601
DYNAMO COND	ONE – CYLINDRICAL – DYNAMO ROOM	212	#18	¾″	6′-0⅞″	202	202
FEED HEATERS	ONE – DEAD END – EACH ENG ROOM	630	#16	⅝″	6′-0⅞″	601	1202

PROPELLERS.

FOUR, SOLID TRUE SCREW, MANGANEZE BRONZE, THREE BLADED PROPELLERS
6 FT. DIA – PITCH AS SET, MEAN, 6 FT 0″ · RATIO OF DIA TO PITCH · 1 · PROJECTED AREA 1702 SQ FT – HELICOIDAL AREA 19 SQ FT · DISK AREA 28.27 SQ FT · HEIGHT OF LOWER TIP OF BLADE ABOVE KEEL · INBOARD 60″ · OUTBOARD 72″ · IMMERSION OF UPPER TIP OF BLADE, LOAD DRAFT · INBOARD 69½″ – OUTBOARD 57½″

BOILERS.

12 NORMAND WATER TUBE BOILERS IN THREE WATER-TIGHT COMPARTMENTS, FOUR TO EACH COMPARTMENT · DESIGNED WORKING PRESSURE 250 POUNDS. TEST PRESSURE 400 POUNDS · RATIO GRATE SURFACE TO HEATING SURFACE 1 TO 46 GRATES 7′-2½″ LONG · 8′-0⅞″ WIDE 49% OF AIR SPACE IN GRATES EXTERNAL HEIGHT OF BOILERS 12′-5⅝″ EXTERNAL LENGTH 11′-6⅝″ EXTERNAL WIDTH 11′-4″ ONE FURNACE, GRATE SURFACE 58 SQ FT, HEATING SURFACE 2670 SQ FT FOR ONE BOILER OR 696 SQ FT GRATE SURFACE & 32040 SQ FT HEATING SURFACE FOR 12 BOILERS 986 – 1⅝ O.D. #10 B.W.G. COLD DRAWN SEAMLESS STEEL TUBES TO EACH BOILER LENGTHS VARY FOR EACH ROW · CLOSED FIRE ROOM FORCED DRAFT MEAN HEIGHT OF SMOKE PIPES ABOVE GRATES 63.25 FT. AREA OF SMOKE PIPES #1 (FORD) 17.72 SQ FT · #2 · 35.78 SQ FT · #3 35.78 SQ FT · #4 (AFT) 17.72 SQ FT
GRATE AREA (EACH GROUP) AREA CONNECTED SMOKE PIPE #1 116 – #2 · 232 #3 · 232 – #4 · 116.

PUMPS AND AUXILIARIES

AUXILIARY	NUMBER	TYPE — MAKE & LOCATION	STEAM CYLINDERS NO	DIA IN INCHES	DIA OF PISTON ROD IN INCHES	STROKE IN INCHES	CONSTANT K = MEAN OF BOTH ENDS	WATER CYLINDERS NO	DIA IN INCHES	DIA OF PISTON ROD IN INCHES	STROKE IN INCHES
MAIN AIR PUMPS	2	BLAKE VERTICAL TWIN BEAM 14 · 35 · 21 ONE EACH ENGINE ROOM	2	14	2¼	21	.00805	2	35	2⅞	21
MAIN CIRCUL PUMPS	2	CENTRIFUGAL WITH VERTICAL COMP ENG BUILT BY B.W. ONE EACH ENG ROOM	2	10 / 16	2	10	.00194 / .00503	42 DIA RUNNER			
MAIN FEED PUMPS	2	BLAKE VERTICAL SIMPLEX PISTON 15 · 10 · 15 ONE EACH ENG ROOM	1	15	2¼	15	.00658	1	10	2¼	15
AUXILIARY FEED PUMPS	3	BLAKE VERTICAL SIMPLEX PISTON 9 · 6 · 12 ONE EACH FIRE ROOM	1	9	1⅛	12	.00188	1	6	1⅛	12
RESERVE FEED PUMP	1	BLAKE VERTICAL SIMPLEX PISTON 10 · 9 · 12 ONE FORD ENG ROOM	1	10	1⅞	12	.00234	1	9	1⅞	12
FIRE AND BILGE PUMPS	3	BLAKE VERTICAL SIMPLEX PISTON 12 · 8 · 12 ONE EACH FIRE ROOM	1	12	2	12	.00338	1	8	2	12
FIRE AND BILGE PUMPS	2	BLAKE VERTICAL SIMPLEX PISTON 10 · 9 · 12 ONE EACH ENGINE ROOM	1	10	1⅞	12	.00234	1	9	1⅞	12
AUXILIARY CONDENSER PUMP	1	SIMPLEX HORIZONTAL COMBINED 6 · 10 · 10 · 12 FORWARD ENGINE ROOM.	1	6	1½	12	.0008		10	1½	12
DYNAMO COND PUMP	1	SIMPLEX HORIZONTAL COMBINED 6 · 8 · 8 · 12 DYNAMO ROOM	1	6	1¼	12	.00082		8	1¼	12
EVAP & DISTILLING PLANT	2 / 1 / 1	DISTILLER CIRC 10 · 9 · 12 / EVAPORATOR FEED 4½ · 5 · 6 / FRESH WATER 4½ · 5 · 6	1 / 1 / 1	10 / 4½ / 4½	1⅞ / ⅝ / ⅝	12 / 6 / 6	.00234 / .000235 / .000235	1 / 1 / 1	9 / 5 / 5	1⅞ / ⅝ / ⅝	12 / 6 / 6
ICE MACHINE	2	ALLEN ONE TON VERTICAL DENSE AIR ON ORLOP DECK FORD OF MACHINERY SPACE	1	8	1⅛	8	.00099	1 / 1	COMPRESSOR 5½ / 6½	1⅛ / 1⅛	8 / 8
									EXPANDER		
OIL CIRCULATING PUMPS	2	BLAKE VERTICAL SIMPLEX PISTON 10 · 9 · 12 ONE EACH ENGINE ROOM	1	10	1⅞	12	.00234	OIL CYLINDER 1	9	1⅞	12
DYNAMO ENGINES	3	GEN ELECTRIC CO CROSS COMPOUND 7½ · 12 · 8 DYNAMO ROOM	2	7½ / 12	1⅝	8	.00087 / .00225				
FORCED DRAFT BLOWERS	6	5 · 5 DOUBLE UPRIGHT B.I.W. DESIGN, ON ORLOP DK. TWO ABOVE EACH FIREROOM	2	5	1⅛	5	.00024				

A · AREA PISTON, SQ IN · a · AREA ROD SQ IN · L · LENGTH STROKE FEET · R · DOUBLE STROKES OR REVOLUTIONS PER MINUTE · P_m · MEAN EFFECTIVE PRESSURE

$K = \frac{(A - \frac{1}{2}a) \times L}{33000}$ $\quad I.H.P. = 2 \times K \times R \times P_m$

*MAXIMUM RATED OUTPUT OF FRESH WATER (DISTILLED) PER 24 HOURS 6000 GALS.

OFFICIAL STANDARDIZATION TRIALS.

COURSE OFF ROCKLAND MAINE – FEB 28, 1908. MEAN DRAFT FOR HIGH RUNS 16′-6½″
TRIM 3½″ BY STERN – DISPLACEMENT 3696 TONS – SMOOTH SEA – SLIGHT SWELL FROM SE

	NO OF RUN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	SPEED-KNOTS	11.254	13.170	11.359	6.465	14.446	16.830	23.865	26.185	24.256	24.262	22.235	20.243	22.111	24.337	22.105	18.836	18.452
HORSE POWER ENGINE AUXILIARIES	MAIN AIR PUMP	I	21	21	22	21	20	19	20	22	21	20	21	23	21	21	21	20
		A	22	22	22	20	20	20	19	20	21	20	20	20	20	20	21	22	21
	MAIN CIRC	I	34	34	36	37	39	76	92	80	81	69	64	69	67	67	67	54	60
		A	23	23	24	20	23	24	31	32	25	28	25	28	27	31	26	24	24
	MAIN FEED	I	30	34	28	38	34	42	66	64	62	60	58	48	46	48	42	38	42
		A	0	0	0	6	6	6	50	60	56	56	76	52	58	48	38	36	28
	TOTAL	I	85	89	86	96	93	137	178	166	164	149	143	140	134	136	130	113	122
		A	45	45	46	46	49	50	100	112	102	104	121	100	105	99	85	84	73
	TOTAL ALL ENG. AUX.		130	134	132	142	142	187	278	278	266	253	264	240	239	235	215	197	195
OTHER AUXILIARIES	SAN PUMP		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	OIL PUMP		1	1	1	1	1	2	2	2	3	3	2	2	2	2	3	3	2
	DYN ENG		33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
	FD BLOWS		6	6	6	6	6	6	200	180	140	150	160	110	90	105	100	85	100
	STEER EN		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
	TOTAL		46	46	46	46	46	47	241	221	182	192	201	151	131	146	142	127	137
	TOTAL ALL AUXILS.		176	180	178	188	188	234	519	499	448	445	465	391	370	381	357	324	332

only has shown any effect of service. A slight thickening at this spot, and the addition of four small baffles about 6 inches square in the soot-boxes at the bottom of each boiler, will remedy this difficulty. Furthermore, the boilers can readily be cleaned. These boilers can be forced to evaporate 11 to 11.5 pounds of water per square foot of heating surface under gage conditions (not from and at 212 degrees). They are not light per unit of surface, but their ability to indefinitely withstand heavy forcing and show good efficiency

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makes them extremely light per unit of power developed.

The turbines are of heavy merchant engine scantlings and should wear indefinitely. The other parts of the machinery are of the bureau of steam engineering's standard thickness, the same as used in all classes of large ships.

Machinery of the Chester type is perfectly suitable for our battleships and armored cruisers. Its adoption will give our country ships that are a knot faster than foreign ships of the same displacement without any increase in machinery weight. Turbines have already been adopted in our latest designs, but while boilers adopted in our latest designs are strong and durable, they are not capable of the high output per unit of surface that can be obtained from the type on the Chester. It seems as if this advantage were worth serious consideration.

DISCUSSION.

Mr. W. F. Forbes: In regard to the statement on page three, it says "on these trials in a very rough sea the turbines did not race." I would ask whether there was any governor attached to prevent racing?

Mr. Frederick Davis Herbert: On page 2 the statement is made: "Although the machinery developed about 50 per cent more than the designed power on this trial, it was not pushed to its limit in any part except the feed system." Please give us just what you mean by designed power. Is that rated power?

Capt. W. Hovgaard: I would like to ask whether these boilers are what would probably be called small tube boilers—what were the diameters of the boiler tubes?

The President: Are there any further remarks upon this paper. If not, I will ask Mr. Wetherbee to respond to these questions.

Mr. Charles P. Wetherbee: Mr. chairman and gentlemen, I might say, before replying to these questions, that we had hoped that this advocating of the semi-express type of boiler would raise more discussion than it apparently has. I know there are people who do not take the view of the use of these boilers which is taken in the paper.

In answer to Col. Stevens' question, as to the governor to prevent racing, there is a governor fitted in the turbine, but the governor is really a stopping device, and not a governor, and it is arranged to shut off steam entirely when the revolutions exceed a certain amount. The governor is set high enough so that the slight variations in revolution that occur when the ship is in a seaway, a variation of 50 turns, would not affect it.

Mr. Forbes: Is that applicable to any other type of reciprocating engine, or is it specially designed for that purpose?

Mr. Wetherbee: The governor?

Mr. Forbes: Yes.

Mr. Wetherbee: The governor is a clutch thrown in by two revolving poles.

Mr. Forbes: It is not a governing feature of the turbine?

Mr. Wetherbee: It is an attachment;

OFFICIAL 24 HOUR TRIAL AT 22.8 KNOTS

COURSE OFF ATLANTIC COAST, MARCH 3 & 4, 1908. SPEED 22.782 KNOTS

DRAFT, MEAN 16 - 7/8" TRIM 5" BY STERN. DISPLACEMENT, MEAN 37115 TONS.

LIGHT TO STIFF N N E TO W N W WINDS. COURSE (COMPASS) VARIABLE. SMOOTH TO MODERATE SEA. POCAHONTAS COAL. RUN OF MINE. POUNDS OF COAL PER HOUR #1 FIREROOM 6378.5 — #2 FIREROOM 5985.4 — #3 FIREROOM 5749.1 — TOTAL 18063.

KNOTS PER TON OF COAL 2.62. POUNDS OF COAL PER SQ. FT. OF GRATE SURFACE 25.95

SLIP OF PROPELLERS IN PER CENT OF THEIR OWN SPEED BASED ON MEAN PITCH. STAR #1 - 15.66 - #2 - 16.94. PORT #3 - 26.08 - #4 - 15.15 - MEAN 18.72

SEE FOUR HOUR TRIAL DATA FOR FORMULA FOR SLIP

DISTILLED 10,070 GALLONS OF WATER IN 24 HOURS

OBSERVATION		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	AVE	H.P.
REVOLUTIONS OF DOUBLE SCREWS PER MINUTE	STAR #1	460	458	454	457	456	459	456	454	455	456	456	456	457	455	454	455	456	454	455	457	455	454	455	460		456.0	43.14
	SHAFTS #2	471	469	463	465	463	463	462	461	462	463	463	464	463	466	464	463	464	463	463	463	462	462	462	463		463.4	
	PORT #3	522	521	455	459	520	522	520	519	520	520	520	520	520	519	520	520	520	521	521	521	521	520	518	453		520.4	43.14
	SHAFTS #4	458	454	457	451	453	454	453	539	452	453	453	454	453	450	452	453	454	453	452	454	453	452	452	453		453.7	
AUXILIARIES	MAIN C	F	19	19	18	20	19	20	20	20	19.5	20	20	20.5	20	19.5	20	20	20	20	18	19	20	19.5	19.5	21	21	19.7	4.20
	AIR PP	A	24	28	24	24	25	24	24	22	23	19	20	20	21	22	19	19	20	19	20	23	20	20	19	21	21	21.4	4.22
	MAIN CIRC	F	160	146	137	137	138	139	144	140	144	120	146	140	146	140	135	134	152	150	147	151	146	146	148	148	144	143.5	4.38
		A	140	154	160	150	148	158	156	160	152	156	157	155	159	160	160	159	158	155	160	160	155	155	157	155	156	156	4.40
	MAIN FEED	F	35	39	40	42	42	25	26	26	30	26	30	24	26	26	26	26	26	26	25	24	25	26	25	24	27	26.7	4.57
		A	—	—	—	—	—	24	22	20	22	21	21	22	21	21	20	21	21	21	21	22	22	21	23	22	22	21	21.5	4.55
	DIS CIRC		36	37	36	38	36	35	35	39	40	42	42	50	50	46	40	36	44	45	44	46	46	50	50	45	49	45.0	
	OIL		17	17	18	19	18	17	16	16	25	22	21	21	22	23	20	21	22	22	22	22	21	22	21	22	23	20.4	2
	OYN ENG																										400	65
	SANITARY																										45	6
	ICE MACH																											5
OTHER BOILERS	BLOWER #1		230	170	159	120	125	120	125	160	165	160	210	210	200	210	180	180	185	180	190	160	170	160	180	200	190		
	#2		220	180	180	100	120	120	125	170	170	165	190	200	170	200	185	205	195	150	200	170	170	170	180	200	180	731.05	57
	#3		230	200	160	130	120	125	120	160	170	170	190	200	200	180	185	150	165	185	195	170	180	170	190	200	180		
	AVERAGE		226	183.3	163.3	116.6	121.7	121.7	123.3	163.3	168.3	165	196.7	203.3	190	196.7	183.3	178.3	181.7	185	195	166.6	173.3	166.6	183.3	100	183.3	
	STEER ENG																										(EST)	5
																											TOTAL H.P. ALL AUXILS	345
ENGINE ROOMS	MAIN ENG	F	230	230	235	230	232	234	224	221	225	240	240	240	230	225	236	227	237	237	225	215	220	218	243	235	210	230	
	STEAM	A	240	245	235	235	230	235	235	230	240	241	242	240	241	225	230	233	225	235	230	230	230	225	240	240	238	235	
	M H P	F	97	97	96	95	96	97	95	95	96	96	96	96	96	96	96	96	96	96	95	95	95	95	95	97	96	96	96
	TUR G	A	95	95	94	95	95	95	90	95	94	96	94	95	94	93	94	95	93	90	90	90	91	92	94	93	90	93	
	L P TUR	F	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	
	AB.	A	145	14.5	14.0	14.0	14.0	14.0	14.0	14.0	14.0	13.7	14.0	13.7	13.8	13.8	13.7	13.7	13.5	13.5	13.7	13.8	13.7	13.8	13.7	13.8	13.7	13.8	13.9
	I P C-AB.		192	192	190	191	192	192	192	193	192	192	192	192	192	193	192	193	192	193	193	192	192	192	192	189	193	192	
BOILER ROOMS	AUX.	F	233	238	240	240	240	236	242	232	250	240	250	245	245	235	245	242	240	245	232	225	225	227	250	245	230	239	
	ST.-G	A	240	245	235	235	230	235	230	230	241	240	243	238	242	225	230	235	235	235	230	230	231	225	240	241	238	235	
	AUX	F	1/16	2	1	1/2	1/2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07	
	EXH-G	A	11	4	4	5	2	2	2	2	2	2.5	2	2	2	2	2	2	2	2	2	2	1	1	3.5	3.0	1.5	2.6	
	OIL	F	2.0	1.5	2.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	3.0	2.4	
	G	A	6.0	6.5	6.5	6.0	6.0	6.0	6.0	7.0	6.5	7.0	7.0	7.0	7.5	7.0	6.0	7.0	6.0	6.0	6.0	6.0	7.0	7.0	7.0	6.5	7.5	6.5	
	ST TO	F	.8	2.0	1.2	1.0	1.0	1.0	0.5	0.7	0.5	1.0	1.0	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	.9	
	GLANDS	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
PRESSURES	VACUUM (HG)	F	28.0	28.0	28.2	28.2	28.2	28.2	28.2	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.3	28.3	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.3	
		A	29.0	29.5	29.5	29.5	29.5	29.0	29.5	29.5	29.6	29.5	29.5	29.4	29.5	29.4	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.6	29.5	29.5	29.5	
	BAROM. @		30.54	30.54	30.33	30.33	30.33	30.32	30.31	30.33	30.34	30.34	30.35	30.40	30.44	30.48	30.45	30.45	30.49	30.50	30.50	30.50	30.48	30.48	30.46	30.46	30.46	30.41	
BOILER PRESSURES	BOILER A		245	245	240	235	235	240	235	245	238	245	245	245	250	250	227	235	227	240	245	235	230	235	245	235	230		
	" B		245	245	240	237	237	242	237	245	238	245	245	245	250	250	231	237	230	242	247	240	230	240	245	240	235		
	" C		245	245	236	235	237	245	236	245	235	245	245	240	250	245	230	245	230	244	240	230	230	240	245	240	230		
	" D		240	245	235	236	235	245	235	243	236	245	245	240	250	240	227	230	228	245	245	230	228	240	245	235	230		
	" E		230	237	231	237	230	235	237	230	235	236	235	230	238	227	240	228	241	240	241	235	226	230	230	240	240		
	" F		235	245	240	237	237	240	237	235	225	240	230	235	235	230	245	225	246	245	246	240	226	235	230	240	240		
	" G		235	235	245	235	235	237	235	230	225	235	227	230	235	227	240	225	241	242	243	240	225	235	230	240	240		
	" H		240	245	242	240	240	245	240	230	225	235	235	230	235	230	245	226	243	245	242	245	230	235	230	245	245		
	" J		225	237	240	235	240	242	235	245	230	230	240	220	240	220	242	230	241	245	245	245	245	240	235	240	245		
	" K		220	235	237	235	237	240	234	245	235	230	240	220	240	217	240	232	242	245	245	245	245	245	235	240	240		
	" L		225	232	235	234	237	235	237	240	240	227	228	220	240	217	237	230	239	240	241	245	245	235	240	240			
	" M		220	236	240	236	240	242	235	245	240	235	245	226	240	222	242	235	241	245	246	245	250	245	240	240	245		
	AVER E		233.8	240.2	238.8	235.3	236.7	240.7	236.2	239.8	232.7	237.3	238.5	231.7	241.7	232.2	237.2	231.0	237.6	245.5	243.8	239.6	234.2	238.8	237.5	239.2	238.9	237.4	
STEAM PRESSURE	#1 F.R.M.		10	625	.5	.5	.5	.5	.5	.625	.5	.5	1.0	1.0	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75	.75		
	#2 "		10	625	.75	.75	.5	.5	.5	.5	.5	.625	.75	.875	.625	.75	.75	.625	.625	.75	.75	.75	.75	.75	.75	.75	.75		
	#3 "		10	625	.5	.75	.5	.5	.625	.625	.625	.75	.875	.75	1.0	.75	.75	.625	.75	.75	.75	.75	.75	.75	.75	.75	.75		
	AVERE		1	626	.583	.666	.5	.5	.542	.583	.542	.583	.833	.917	.708	.833	.75	.708	.666	.75	.75	.75	.75	.75	.75	.75	.75	.702	
TEMPERATURES	INJ.	F	35	38	38	35	35	38	37	36	35	38	37	38	39	35	38	38	37	37	37	36	37	37	36	34	34	36	
	ECTION	A	34	31	36	34	34	36	38	34	37	37	36	36	38	34	38	38	38	36	34	34	36	34	35	33	34	36	
	DIS.	F	58	68	68	64	65	67	62	60	64	65	63	67	65	62	66	66	62	63	63	62	64	58	62	60	60	63	
ZONE	CHARGE	A	60	61	58	58	58	60	60	54	60	59	58	60	61	58	60	60	60	58	58	58	60	58	58	57	58	59	
	AIR PMP	F	70	74	74	77	76	78	76	72	78	80	78	78	80	74	72	75	74	76	74	74	77	66	72	66	65	74	
	DISCH	A	70	68	65	64	64	65	64	70	73	64	72	73	75	70	72	74	73	72	72	76	73	71	73	70	68	70	
	FEED TO	F	78	84	82	80	80	83	80	80	86	82	84	88	84	81	76	82	90	82	83	84	84	82	82	82	84	83	
	HEATER	A	74	74	76	74	72	74	77	82	84	83	80	81	85	79	82	82	82	82	84	84	84	84	85	84	72	80	
	FEED FR	F	180	182	178	175	180	190	188	176	176	180	188	186	190	180	180	188	180	179	181	181	167	166	195	188	190	182	
	HEATER	A	—	—	—	—	—	204	190	200	202	206	206	210	208	207	208	204	204	205	204	204	202	204	214	216	206	205	
	ENG RM	A	54	56	64	72	70	72	78	76	74	73	73	73	72	67	68	70	70	74	74	64	66	68	67	65	62	68	
	OUT AIR	A	30	30	32	32	34	36	38	36	35	34	34	33	33	33	32	32	30	30	28	24	26	28	28	28	32		
FIRE ROOMS	#1 F.R.M.		48	52	62	62	60	62	60	60	60	60	58	60	50	54	54	54	53	54	52	52	54	54	50	46	46		
	#2 "		56	56	40	56	62	62	62	60	56	56	56	56	60	54	56	54	54	56	54	56	52	52	52	52	52		
	#3 "		52	46	52	54	56	52	54	54	54	54	54	56	50	48	50	52	53	54	56	48	46	46	46	48	46		
	AVERAGE		52	51.3	58	57.3	59.3	58.7	58.7	58	56.6	56.6	56	57.3	53.3	52	53.3	53.3	53.3	54.6	54	52	50.7	50.7	49.3	48.6	48	54	
UPTAKES	#1 PYROM		660	670	620	640	640	600	620	600	640	630	600	620	620	620	600	620	610	620	600	620	620	620	660	700	690		
	#2 PYROM		600	620	640	580	560	680	580	580	590	590	600	600	600	600	600	610	620	610	600	610	640	640	640	610	610	610	
	AVERAGE		630	645	630	610	600	650	590	590	615	610	600	610	610	610	600	615	615	610	605	630	630	630	635	655	650	646.7	

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OFFICIAL 24 HOUR TRIAL AT 12 KNOTS

COURSE OFF ATLANTIC COAST FEBRUARY 28 & 29. 1908. SPEED 12.2 KNOTS.
DRAFT, MEAN. 16 ft 7 3/4 in. TRIM 6" BY STERN. DISPLACEMENT, MEAN 3710 TONS.
FRESH 5 TO 6 N.N.W. WIND. MODERATE SWELL FROM N.W.W. TO ROUGH SEA FROM S.E.
COURSE (COMPASS) E.N.E TO W.S.W. - VARIABLE. POCAHONTAS COAL, RUN OF MINE.
POUNDS OF COAL PER HOUR 4091. KNOTS PER TON OF COAL 6.68.
POUNDS OF COAL PER SQ. FT. OF GRATE SURFACE 17.63. SLIP OF PROPELLERS IN PER CENT OF THEIR OWN SPEED, BASED ON MEAN PITCH. #1 STARBD 12.21 #2 STARB'D 24.66 - #3 PORT 19.55 - #4 PORT 12.08 - MEAN SLIP 17.48.
SEE FOUR HOUR TRIAL DATA FOR FORMULA FOR SLIP.

OBSERVATION		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	AVE	
MAIN TURB. REVOLUTIONS OR D'Y'L STROKES	STAR.	#1	232.5	233.7	229.0	234.4	234.0	233.6	230.9	235.0	234.7	232.2	231.2	224.9	231.1	243.4	252.0	255.2	260.4	230.3	229.5	231.1	230.7	230.9	230.1	227.9		234.70
	SHFTS	#2	268.5	269.3	266.8	272.9	269.4	269.5	269.0	270.3	271.0	269.0	269.6	266.1	269.8	284.5	296.0	296.9	302.5	267.5	270.5	268.1	271.6	271.7	271.7	262.2		273.47
	PORT	#3	253.2	254.8	250.1	261.7	262.9	253.9	258.4	256.5	259.4	255.3	259.1	245.4	240.0	265.5	273.9	275.7	285.5	247.4	248.3	248.5	258.9	258.6	257.9	253.3		254.71
	SHFTS	#4	231.1	232.5	229.0	232.5	232.6	234.7	234.3	232.5	228.7	228.1	224.8	226.0	226.0	242.3	251.7	254.5	260.1	227.9	229.2	230.1	231.3	232.6	231.7	229.0		234.58
ENG. AUXILS OTHER AUX.	MN AIR	F	12	10	15	9	10	9	11	12.5	11	11	11.5	11	11	8	7	9	9	8	10	11.5	12	11	11	9.5		8.6
	PUMP	A	11	11	12	11	12	12	12	12	12	12	12	12	10	9	11	12	12	12	12	12	12	12	12	12	11	11.5
	MAIN	F	136	80	86	80	112	140	134	132	129	133	102	96	89	94	97	97	100	110	117	118	110	120	114	100		109.4
	CIRC.	A	85	80	80	116	120	121	122	122	120	119	118	114	122	97	102	121	119	117	118	117	120	121	120	122	121	113.4
	M.FEED	F	5	8	8	9	12	10	6	11	9	8.5	7.5	9.5	9	7	12	11	11	15	12	12	11	11	12.5	11		10
	SANITARY		15	16	16	15	16	17	16	20	17	16	17	16	17	12	16	16	16	18	16	18.5	19	19	19	18		16
	DYN. ENG.																											400
	STEER. ENG.																											
																					TOTAL H.P FOR ALL AUXILARIES							120
PRESSURES. ENGINE ROOMS.	MAIN STEAM	F	135	159	174	141	164	145	156	161	149	144	144	136	119	127	139	148	129	144	144	156	160	162	152	146		148
		A	153	154	159	168	169	134	158	153	149	153	148	148	123	135	138	149	128	140	156	157	148	150	148	148	138	148
	M.H.P. TURB. G	F	8	7	7	7	8	7	7	7	8	8	8	8	8	8.5	15	14	13	8	7	6	6	6	6	6		8
		A	6	6	7	7	7	6	6	6	6	6.5	7	6.5	7	8	7.5	10	10	10	6	5	5	6	6.2	6.2	6	6.8
	L.P. AB TUR.	F	3.3	3.3	3.3	3.0	3.3	3.5	3.3	3.3	3.3	3.3	3.1	3.2	3	3.3	4	4	3.7	3.1	3.1	3	3	3	3	3		3.3
		A	3	3	3	3	3.5	3.5	3.5	3.5	3.2	4.0	3	3	3	3.5	4	4	4	4	4	3.5	3.5	3	3	3	3.2	3.4
	H.P.C.- G		58	57	70	75	75	71	70	71	75	76	77	76	76	94	105	104	104	76	74	76	76	74	71	74		77.5
	I.P.C-AB		32	33	33	34	34	32	31.5	31.5	34	34	34	34	35	40	44	44	44	33	32	32	33	32	32	32		34.6
	AUX. STEAM	G F	175	172	150	162	175	155	160	170	150	170	155	147	125	140	145	155	133	155	160	162	175	165	166	155		157
		A	134	160	160	169	170	135	159	155	152	155	150	150	126	138	141	151	130	145	160	160	151	153	150	150	139	150
	AUX. EXH.	G F	2	2	1	1	2	1.5	1.5	1.5	2	2.5	1	1.5	1	2	3	5	3.5	2	1.5	.5	2.5	2	2	2		1.94
		A	2	2.5	2	3	4	3	2	3	4	4	4	3.5	2.5	2	4	5	5	6	3	2	2	2.5	3	2.5	2.5	3.1
	OIL	F	1.5	1.0	.3	0	.5	2	1.0	.2	0	0	0	0	0	0	.5	1	.5	1	.5	.5	.2	.2	.2	.1		.4
	G	A	4	5.5	5.5	4	5	3	3	4	4	4	3	3.5	4.5	4.5	5	6	3	5	5	5	4	4.5	4	4.5	3.5	4.2
	ST. TO GLAND	G	1.0	1.0	.2	1.0	1.0	.5	1.0	.5	.5	1.0	1.2	.8	1.0	1.0	.5	1.0	.8	.2	1.0	1.0	2.0	1.0	1.5	1.0		.9
		A	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	IN THE FEED HEATER-S		F	2	2	1	1	2	1.5	1.5	1.5	2	2.5	1	1.5	1	2	3	5	3.5	2	1.5	.5	2.5	2	2	2		1.85
	VACUUM (INS)		F	28.3	28.2	28.2	28.2	28.3	27.0	28.2	28.5	28.5	28.5	28.6	28.6	28.6	28.0	27.5	27.8	28.2	27.2	28.5	28.6	28.7	28.7	28.7	28.7		28.4
		*	A	28.0	29.0	29.0	29.0	29.0	28.5	29.0	29.0	28.8	28.0	29.0	29.2	27.5	28.0	28.0	28.5	27.5	28.5	29.0	29.0	29.0	29.2	29.0	29.1	28.0	28.6
	BARO 'R'	@		29.34	29.34	29.34	29.34	29.36	29.36	29.36	29.36	29.36	29.38	29.38	29.38	29.38	30.0	30.0	30.0	30.0	30.0	30.1	30.1	30.16	30.16	30.16	30.16		30.02
BOILER ROOMS GAUGE PRESS.	BOILER J			185	156	165	182	165	140	160	155	160	155	155	150	135	135	150	125	145	150	150	160	160	165	160	160	135	
	" K			190	155	163	175	160	145	165	167	150	150	150	145	130	139	153	127	143	145	145	155	150	160	150	150	130	
	" L			185	152	160	175	160	140	160	155	150	150	150	145	130	130	151	125	144	146	140	155	155	150	150	155	130	
	" M			190	155	162	177	162	144	165	160	150	150	150	135	133	134	124	146	150	145	157	150	160	150	155	135		
	AVER'E			187.5	154.2	162.5	177.2	161.7	142.2	162.5	159.2	157.5	151.2	151.2	147.5	132.5	133.2	152	125.7	144.5	147.5	145	156.7	153.7	158.7	152.5	155	132.5	152
TEMPERATURES. ENGINE ROOMS.	INJ-ECTION	F	32	33	34	34	35	34	38	38	38	36	36	36	36	34	38	38	38	36	34	34	35	34	34	35		35.4
		A	32	30	32	32	34	34	36	38	38	35	35	35	35	35	38	38	34	34	34	34	34	33	33	34	34	34
	DIS-CHARGE	F	41	44	46	46	44	34	41	43	45	38	45	45	49	36	40	40	50	46	42	36	43	41	42	44		42.8
		A	45	48	48	36	40	38	38	42	40	39	37	37	36	37	37	40	40	38	36	36	36	35	35	36	35	39
	AIR P'P	F	56	71	74	74	66	54	54	58	57	62	60	59	63	68	68	54	58	60	52	55	54	56	54	58		60.2
	DISCH.	A	46	52	50	46	48	46	48	50	52	52	47	47	48	47	48	48	48	46	42	43	44	46	46	46	48	47
	FEED TO	F	68	66	69	70	60	58	52	54	58	56	53	58	56	56	58	62	60	58	54	54	51	56	56	55		58.2
	HEATER	A	56	58	58	56	60	60	60	62	61	60	58	58	58	59	59	58	60	54	60	61	56	62	61	61	56	58
	FD.FR.HR	F	182	140	140	135	128	125	114	170	150	210	198	180	162	208	206	220	200	200	175	190	158	152	140	134		167.4
	ENG.RM	A	76	72	72	72	70	70	71	72	71	70	64	64	56	56	54	56	62	74	76	68	74	82	77	76	72	68
	OUT. AIR			34	33	32	30	31	31	29	29	28	26	24	23	23	25	26	29	30	36	31	32	24	24	26	22	22	28
SMOKE TEMPERATURES	#3 FIRE'M			58	56	70	48	46	52	50	50	48	48	48	46	52	52	52	52	56	40	40	44	48	48	46	42	40	49.3
	#3 PYRO'R			340	330	280	300	315	300	285	300	300	310	290	300	250	260	280	260	285	350	225	220	210	220	210	200	200	
	#4 "			680	780	825	890	875	875	845	840	850	900	860	900	850	855	890	925	940	950	900	850	850	890	900	910	880	
	AVERAGE			510	555	552.5	595	595	587.5	565	570	575	605	575	600	550	552.5	585	592.5	612.5	645	562.5	535	530	555	555	555	540	570.9

it could as well be applied to close the throttle of a reciprocating engine, if found desirable.

With reference to the question of exceeding the designed power by 50 per cent, I am sorry that apparently was not made clear in the paper, for the reason that I have been asked that question by several others. That statement is based on the fact that the ship was designed for an effective horsepower, necessary to give 24 knots. The effective horsepower, corresponding to the observed speed, on the four hour trial, was about 50 per cent in round figures more than the effective horsepower necessary for 24 knots, and that is what that statement is based upon.

In reference to Capt. Hovgaard's question, as to boiler tubes, that is given on page 2. Speaking from memory they are 1 3/18 outside diameter, No. 10 gage. If these tubes are used on battleships, I would recommend that the tubes be 2 in., and about No. 9 gage. The only feature recommended by me is the ability to stand a high rate of forcing, which comes from the fact that the boilers have a good circulation, and it is not necessary to have the particular make of boilers used in the test, but any boiler that has a good circulation and will evaporate as high as 11.5 pounds of water per foot of heating surface will be equally efficient.

Col. Stevens: Will you state how you get at the 0.55 per cent propulsive efficiency?

Mr. Wetherbee: Recent results have shown that is wrong, that at full power it is nearer to 0.48 than 0.55.

Mr. F. L. DuBosque: There are many of us who would like to discuss the type of boiler Mr. Wetherbee speaks of, and if he will have the kindness to give us a detailed drawing of it, in connection with this discussion, it would enlighten us a great deal, and be a benefit to the society and others interested in the paper, which would lead us to discuss the type of boiler he speaks of.

Mr. Wetherbee: I do not think there would be any objection on the part of the navy department to publishing that. It is an ordinary Normand bent tube boiler. I do not think that the bent tubes are vital, as there are straight tube boilers which will give the same rate of evaporation. The boilers in the test are practically any type desired, express types or small light tubes, used in destroyers and torpedo boats, and what I may call the battleship type, 2-in. tubes, which I recommended a moment ago.

Mr. W. L. R. Emmett: I ask Mr. Wetherbee what the gage conditions were to which he refers on page 4, and I would like to know the feed water temperature corresponding to the 11.5.

Mr. Wetherbee: The evaporation for that amount has been obtained by us on our torpedo boats. We installed feed water heaters that put the water into the boilers anywhere from 210 to 240 degrees temperature, and you can take as an average about 220 degrees for the feed water supply for the boilers, and the gage pressure at the boiler is about 230 pounds, and those are the conditions under which the boilers will evaporate 11.5 pounds of water for any coal.

I have recently been trying to get some oil burning people to guarantee such results, and I cannot get it. None of them care to give over 11 pounds.

Capt. W. Hovgaard: I quite agree with Mr. Wetherbee, that if we could get a boiler of high evaporative power we should make a great step in advance, as far as warships are concerned, because the pressure on the warship design of the same weight is so enormous that any movement in that direction is bound to be accepted, if the solution is practicable.

In the German navy, as you perhaps know, they have adopted a small tube boiler, or at least a modification of a small tube boiler, for all classes of ships, from torpedo boats to battleships, and in that way they have attained a great uniformity in the ser-

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vice in the boiler rooms and undoubtedly great advantages in saving weights. In particular, the weight saved in the German ships cannot fail to be very great in that item. I think we are undoubtedly moving in the direction of some such intermediate type of boiler as Mr. Wetherbee recommends. I think it is a question for the consideration of engineers who have to do with warships.

Mr. L. H. Chandler: It is possible that I have had as much experience with the type of boiler that Mr. Weatherbee speaks of as any one in the service. From the point of view of practical operation, I had the grate built by the Bath Iron Works, and had a great deal of experience with them, and also with a good many other types of torpedo boilers, and my experience is that the Normand boiler—from my personal point of view—I would rather take care of it and operate it than any other type of boiler I know, as I had less difficulty with it and secured much better practical results. They are easy to clean, and it is possible to clean the most difficult places, that it, where the tubes enter the lower drum, it is remarkable in that particular the ease with which you can clean them, especially the lower drum and guard against pitting of the tubes around the part where they enter the lower drum.

Mr. Forbes: How do you do it?

Mr. Chandler: The form of the casing is such that it forms a pocket below and outside of the lower drum, and you get inside, preferably with an air blast, and blow through, and the dirt drops out into this pocket, and you hook it out with a hoe. I know of nothing so easy or satisfactory as that arrangement.

As far as forcing the boiler is concerned, I tried on one occasion, when we were trying to speed up a little on the boat—there was a sort of family competition among the water tenders on the different boats; I was in the engine rom and did not intend to force her, and I looked at the air gage on the aft fire room, and found the water tender running with 10 in. of air pressure. It was doing beautifully. I do not know how long they ran that way, but the boiler never said anything about it, except to furnish steam.

The Heffernan Dry Dock Co., Seattle, Wash., has the contract for converting the bark St. James into a barge for her new owner, James Griffiths, of Seattle.

MERCHANT MARINE CONGRESS.

The Merchant Marine Congress, which continued in session practically throughout the whole of last week in the Metropolitan Temple, New York, was of the utmost importance. Illness kept Mr. Edwin S. Cramp, of Philadelphia, from presiding at the opening session on Monday, Feb. 1, but his place was ably filled by Congressman W. E. Humphreys, of Washington, who delivered the principal address.

On Tuesday evening Mr. Louis Lombard presided and the principal address was made by John Barrett, director of the International Bureau of South American Republics. Mr. Barrett spoke of the South American market offering greater openings for the extension of American foreign trade than any other port of the world. He urged New York to be the leader in the development of this trade. He said, however, that it was just as important to have facilities on sea as on land to advance international intercourse. The immeasurable benefit to commerce of quick mail exchanges and the unquestionable advantages of fast and commodious means of communication now possessed by Europe, and entirely neglected by the United States, are self-evident to every student. No line now flying the American flag goes south of Panama.

The principal speaker on Wednesday evening was Hon. J. T. McCleary, of Minnesota. He was introduced by Mr. Edwin S. Cramp. Mr. McCleary is especially well informed on American shipping, as he was for several years in charge of the delivery of the mails oversea. Mr. McCleary's views are very clear. He definitely advocates subsidy. The Pacific ocean, he declared, with its enormous American coast line, should be an American lake, yet, today, there are only seven ships flying the American flag.

Henry Clews, the banker, spoke on Thursday evening. Mr. Clews advocated free ships, but in this view he was most vigorously attacked by Mr. Joseph G. Butler Jr., president of the Merchant Marine League of the United States. He maintained that free ships would accomplish nothing except the destruction of American ship yards and pointed out that President Roosevelt, President-elect Taft and Speaker Cannon are definitely in favor of subsidies. Robert Watchorn, of the immigration department, also opposed the building of American ships in foreign yards. Such a policy, he declared, would result in the lowering of wages of American seamen.

At the concluding session on Friday, Col. John T. McCook presided, the principal address being delivered by Mr. Leslie M. Shaw, formerly secretary of the treasury. Mr. Shaw proved a most vigorous and eloquent speaker. He referred to the cruise of American battleships around the world, pointing out that they were accompanied by 47 foreign colliers that would be withdrawn at a moment's notice.

THE CITY OF EVERETT.

Capt. Alex McDougall, of Duluth, believes that the steamship Republic, which sank off Nantucket, could have been saved if the vessel's master had allowed the whaleback steamer City of Everett to take his ship in tow.

"The city of Everett could have towed the Republic to Liverpool if it were merely a matter of power," said Capt. McDougall. "The whaleback is a powerful vessel and there are few, if any, boats on the ocean better adapted to the very work. I think it was a great mistake on the part of the master of the Republic that he did not accept the offer of the master of the whaleback, for he doubtless could have taken the ship to the shore of Martha's Vineyard and there beached her. It is the popular theory that a large vessel cannot be towed at sea, unless she has a rudder, but in weather such as prevailed at the time of the loss of the Republic, it would certainly have been managed. There would be a tendency to strain from side to side, but she would have come ahead all right."

The steamer City of Everett gives the story of the Republic something of a local color, for she was a whaleback and her hull was planned in Duluth and built at Everett, Wash., the Duluth *News-Tribune* says. She is now in the employ of the Standard Oil Co., and her career has included numerous incidents of more than ordinary interest. She carried a cargo of food to the famine sufferers of India, and was the last merchant vessel to quit a Spanish port at the breaking out of the war of 1898. The City of Everett was in the Galveston storm, and her success in making the bay and coming to anchor was commented on at the time.

The cargo of food referred to was grain contributed by the people of the Pacific coast. Her visit to India and her subsequent passage through the Suez canal, and in fact her whole voyage, was a sensation, for besides her whaleback build she was the first merchant steamer seen in those waters flying the American flag and it is probable the only one. She may be said to be the only American merchant steamer to have circled the globe.

She was the only ship built in the yards of the Pacific Steel Barge Co., as the Everett yard of the parent concern at Superior was known.

Her machinery was built by the old Frontier Iron Works, of Detroit, from designs from Mr. Henry Penton, and was installed by Mr. Jas. M. Smith, now manager of the Collingwood Shipbuilding Co. Her first master, who also navigated her on her eventful trip, was R. D. Bucknam, formerly on the lakes and now Bucknam Pasha, at the head of the Turkish navy, into which service he went with the delivery of the cruiser Medjidia, built for the sultan by the Cramp Co., of Philadelphia, in 1904.

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ATLANTIC COAST NOTES.

Office of the MARINE REVIEW,
Room 1005, No. 90 West St.,
New York City.

By passing Daunt's Rock lightship at 5:10 P. M., Monday, the Cunard liner Mauretania established a record for the long route. The entire distance of 2,934 miles was covered in 4 days, 20 hours and 27 minutes, thus making an average speed of 25.20 knots. The day's runs for the trip were 491, 605, 594, 567, 582, and 95 miles to Daunt's Rock. The best previous record from Sandy Hook to Daunt's Rock over the long course was 5 days and 5 minutes, made by the Mauretania in March, 1908.

The Norwegian steamship Munin, which was for a time believed to be the unknown vessel sunk off the Diamond Shoals Lightship, is reported safe at Darien, Ga. Owing to the fact that the vessel encountered a haze on approaching the coast, and the vicinity was strange to the vessel's captain, the Munin cruised in the waters for several days and at last got a pilot at Tybee.

The Hamburg-American liner Deutschland grounded on a North River shoal while outward bound for Mediterranean ports on Saturday, floating again, uninjured, in about two hours. She lay at anchor all night in Gravesend Bay, proceeding to sea at daybreak by the Ambrose channel.

The new regulations of the Department of Commerce and Labor, limiting the length of hawsers between towing vessels and seagoing barges in tow, and the length of such tows within inland waters, went into effect on Feb. 1. It is said that the result may be an increase in freight rates to points along Long Island Sound and New England.

The house committee on merchant marine and fisheries has acted adversely on the bill to compel sailing vessels of 300 tons and over to carry licensed pilots. It is argued that hundreds of vessels trading on the coast are controlled by masters who have learned their business well enough by practical experience and who are as competent in their own particular line of duty as any men that could be had.

The torpedo boats Porter, Shubrick and Stockton, with the torpedo-boat destroyer Worden left Hampton Roads Friday morning for Charleston. A terrific gale encountered forced the Porter to put back, the Stockton making Beaufort, N. C., and the Shubrick making Morehead City. The Worden succeeded in making Charleston after what Lieut. Richardson, her commander, declared was the roughest trip he had ever taken.

The overdue German steamship Maria Rickmers, which sailed from Greenock for Philadelphia, on Jan. 2, arrived at Philadelphia on Feb. 5. The Rickmers left the Clyde in ballast to load petroleum for Japan, her long run being due to continuous storms encountered while flying light.

The Atlantic Transport liner Minnehaha will sail from London for New York on Feb. 15. She will stop at Southampton for passengers and cargo in place of the steamship St. Louis, now at New York undergoing repairs.

The British steamship Mort, from Huebra for Philadelphia, was compelled to put into the Bermuda Islands last week to renew her supply of bunker coal. The Mort reported having encountered continuous heavy weather on the Atlantic passage as the cause of her supply of coal giving out.

The failure of the four-masted bark Fort George to arrive at Honolulu, for which port she sailed from New York on July 26 last, or to have been spoken anywhere since last August, has given rise to fears for her safety. She was last spoken on Aug. 27, in latitude 11 north, longitude 25 west. The Fort George has a cargo of 2,500 tons of general merchandise, and, besides the captain and his wife, carries a crew of 18 men. She is owned by Welch & Co., of New York, and is of 1,705 tons net register.

The Cunard liner Lusitania, from Liverpool for New York, put into Queenstown on Sunday night, 12 hours late through meeting with adverse weather. During Sunday night, while at anchor, she lost one of her anchors and many fathoms of chain. While at Queenstown 600 tons of coal were put into the big vessel, to replace the extra amount consumed while coming down the channel.

The United Fruit Company has decided to install the wireless telegraph system on all of its steamers. These include the Admiral Dewey, Admiral Farragut and Admiral Schley, trading between Philadelphia, New York and the West Indies.

The three-masted schooner Horace A. Stone arrived at Norfolk this week with the greater part of her sails, topmast and rudder-head gone. She was en route from Tampa, Fla., to Norfolk when severe gales were encountered coming up the coast. She was blown 275 miles to sea, and under improvised sails and jury rudder got back to Norfolk.

The Baltimore Wrecking Company has contracted to save the cargo and float the schooner Helena, already mentioned in this column as ashore near Scituate, Mass. Tugs and lighters have left Boston to begin work at once.

The crews of the three wrecked British steamships Alnmere, Hesleyside and Dahomey arrived at New York from the Bahama Islands last week. The Alnmere was wrecked on the Abaco Island on Jan. 24, and the Hesleyside last October. The Dahomey was wrecked at Nassau on Dec. 29. The three vessels were total losses.

The trans-Atlantic rate war, it is announced, is ended, the various shipping companies attending the conference at Paris having reached an agreement on all the points relating to the traffic from the Mediterranean ports to the United States. The terms have not been announced, but the basis of agreement for steerage and second class passengers between Italy and the United States, which has been one of the chief points at issue, is the same as that set forth in the international agreement regarding transportation between other European ports and North America.

The Haverford and Merion, the American liners withdrawn from the Philadelphia and Liverpool service in December, owing to the cattle plague, and placed in the Liverpool and Portland service, have been ordered back to their old route.

Silas M. Harding, superintendent of the Maine and New Hampshire life saving service, has recommended to the officials of the service at Washington, that the new Isle of Shoals life saving station be equipped with wireless telegraph apparatus. The station is 13 miles from the mainland and is now under construction.

The storm of Saturday night completed the destruction of the schooner Golden Ball, which went ashore on Egg Rock, off Jonesport, Me., on Thursday. The Golden Ball, a three-masted craft, was driven ashore while bound for St. John's, N. B. Two revenue cutters were dispatched to her assistance, but the blizzard of Saturday prevented salvage work.

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THE PROGRESS OF RIVER IMPROVEMENTS IN THE VICINITY OF PITTSBURG.

BY J. W. ARRAS.

(Continued from Feb. 4.)

About June 8 the stage of water for the first time this season became favorable for raising the movable dams in the Pittsburg district, and all of the dams previously maneuvered were put up. Nos. 3 and 4 had just been completed by the contractors and a little work still remained to be done by the government, such as clearing away remains of cofferdams, removal of sedimentary deposits in lock gate recesses, placing of a few horses, props and wickets, etc. These required only a few days and on June 25 No. 3, and on the 30th No. 4, were also up, completing for the first time in this locality a movable dam slackwater 35 miles in length, extending from Aspinwall on the Allegheny to Merrill, three miles below Beaver, on the Ohio. No blaring of trumpets or ostentation of any kind accompanied these initial operations, which were performed in the usual way, much as if the structures had been in use for years. For a short time the full benefits of all the pools were not attained. An extension of the lower guide wall at Davis island dam necessitated the depression of pool 2 about 1 ft. below its normal level until its completion in August. Immediately above dam 4 the Jones & Laughlin Steel Co. was engaged, under a contract, in constructing a huge water intake pier, and culverts connecting it with a pump station at bank. The gravel cofferdams surrounding a part of this work, and the immense caisson for pier, located directly above one of the bear-trap gates and the Chanoine wicket weir for regulating pool 4, were considered so much a menace to the operation of the dam that it was deemed best by those in charge to afford every reasonable facility to the contractor for speedily prosecuting his work to a stage more favorable for the dam maneuvers. This required about one month, during which time the pool was held down from 1 to 3 ft. below its full height.

ENTIRE WORK ACCOMPLISHED.

Happily, this entire work has been successfully accomplished, and its obstructiveness as a menace to the dam removed. Necessarily also during the progress of construction deposits and various debris accumulated in the vicinity of the locks, which, being indifferently removed by contractors, occasioned slight obstructions to navigation when diverted from the open river channel to locks. These, as the season progressed, were removed by the government dredges, together with a low bar below lock 3 and a small ridge deposited in the recently dredged channel through Lacock's bar below dam 5. Accordingly these pools are now in excellent condition, having remained full during the recent unprecedented drought and the locks and dams in perfect working order, requiring under the present water conditions very little attention, considering their newness. The number of breakages has been extremely small, and of no importance worthy of mention.

In view of the long service of Davis island dam, of which general type are also all the other movable dams in this district, it is singular what strange views should be entertained concerning them. Some persons—and not a few—had been patiently awaiting the construction of ordinary fixed dams. Others apparently understanding the dams are movable, never expect to see them lowered. The movable feature in their estimation was only intended to facilitate their initial raising or establishment. Even some navigators, although thoroughly familiar with the nature of these dams and their navigation, were quite incredulous as to the new ones, and are only being reassured by degrees that there is no greater reason for doubting the capacity of one to remain up and fulfill its mission than another.

DESIGN OF MOVABLE DAMS.

While it is true the general design and main characteristics of these movable dams and their locks is practically the same and the same principles are involved in all, yet in dimensions and in the character and details of construction they differ widely. The wickets, which comprise the important feature of all the dams, are of the Chanoine type, a French production invented over half a century ago, and extensively used in Europe. In outline they resemble each other closely, except as to length, but in details of construction they differ. Those in the older dams, at Herr island, Davis island, and at Merrill, are paneled wickets having heavy oaken frames filled in with 2-in. planks. The modern wickets are built of heavy timbers throughout, enabling them to better withstand the abuse to which they are inevitably subjected. They are uniformly 3 ft. 9 in. wide, being set 4 ft. between centers, thus leaving 3 in. spaces for clearance in maneuvering and for the more exact regulation of pools. In length they vary from 9 ft. 9 in. of the shortest weir wickets at Davis island dam to 17 ft. 10⅝ in. of the longest pass wicket at dams 2 and 3. These form the principal movable feature of the dams proper and those parts of the weirs extending from bear-trap gates to abutments. They are raised endwise against the stream and in lowering fall with it, lying parallel with the current. In rising or lowering they act much as would a door or shutter hinged at its upstream end. But to facilitate their raising they are hinged near the middle to a steel framework called the "horse," which at its lower end is in turn hinged to the concrete foundation of the dam, thus forming a double hinge. When up they are supported by huge steel props, one end of which is attached to the horse where it is hinged to wicket, while the upstream or bottom end of wickets rests against sill of dam. At both ends of wickets are handle plates in which engage hooks used for maneuvering them by the operating forces on the boats. The manipulation of the raising and lowering hooks requires trained men. These usually become so expert in a few years as to be able to engage the raising hook in the wicket handles without much difficulty regardless of the velocity or erratic movements of the current. Having taken hold of the handle the wicket is quickly drawn upward, although retaining a comparatively horizontal position, by means of a specially constructed hoisting engine on the maneuvering boat until the foot of prop is heard to drop into a notch in the cast iron hurter also attached to the concrete foundation of the dam. Then the hook is released and the current with slight assistance drives the upstream end of wicket down against the sill. In lowering, the top of downstream end of wicket is drawn upstream by the maneuvering boat engine only a few inches until the foot of the prop drops a second time into a sliding step by which in lowering the prop is diverted around the first notch into the proper channel or track in hurter for again raising it. This mechanism is extremely simple and hence readily adaptable to great strength, which is most essential.

NAVIGABLE PASSES OF MOVABLE DAMS.

In the Pittsburg district the navi-

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gable passes of movable dams vary in width from 500 ft. in the Herr island dam to 600 and 700 ft. in the Ohio river dams. Ordinarily the pass wickets alone are maneuvered from boats, while the weirs are equipped above with trestle service bridges from which the wickets are operated in much the same manner as are the pass wickets, save that hand power is frequently substituted for steam power, and the weir wickets have chains attached and leading to bridges to facilitate their maneuver and to obviate the difficulty of grappling for them with pole wicket hooks. The wicket weirs are used in conjunction with the bear-trap gates for regulating the pools and initially controlling rises until the stage compels lowering of navigable passes. In the order of arrangement the navigable pass almost invariably adjoins the lock, followed by the bear-trap gates, the wicket weir closing the remainder of the river.

But the most valuable and important feature of the movable dam is its automatic weir without which its operation would be very difficult. For that purpose in this locality the bear-trap gate is used. That type of dam is not a new device, having been invented by Messrs. White and Hazard about 1818. These men were interested in the anthracite coal business on the Lehigh river, in the eastern part of the state. Being unslackwatered at that time the Lehigh, like most streams in this section of the country, often became too low for transportation purposes for long continued periods of time. For overcoming this inconvenience and loss White and Hazard set about to devise as a substitute for a lock and dam system, a scheme comprising an inexpensive fixed dam equipped with a weir that could be opened and closed automatically, that is in the sense that the head produced by the dam would furnish the power, properly applied, for maneuvering gates turning on horizontal axes upward or downward without the assistance of extraneous forces. Thus with weir closed a pool would be formed for loading and storing coal vessels, and when open a chute would be provided for navigation through the dam with sufficient water from the pool, augmented perhaps by a small rise, to float the product to a pool farther down and finally to market. Having conceived the idea of an automatic dam, and doubtless prepared a working model for testing it, they proceeded to construct a crude wooden dam for practical use. To be sure, their inquisitive neighbors were anxious to discover the mysteries of the new and unfamiliar construction on which they were engaged. Doubtless not being overconfident of its success, and the structure resembling in general appearance, weight, etc., a primitive deadfall bear-trap, they informed them it was a bear trap. After its completion and successful operation the name adhered to it and has since remained unchanged. Of all well-known movable dams for practical uses this is the pioneer, and with the exception of a few unimportant designs is also the only strictly American movable dam, nearly all others that have been thoroughly tested in a practical way, such as the Boule, Drum, Poiree Needle, Curtain, Chanoine wicket and others, being of French invention. Although for many years neglected, and once tried and condemned by French egineers, it has finally come to the front and that to stay. It is ideal in principle, extremely simple in design and construction, loses little water in operation, requires almost no attention or protection against injury and is by long odds the easiest of all movable dams to operate.

BEAR TRAP GATES FORMERLY OF WOOD.

In their earlier construction, and indeed until within a decade, bear-trap gates were built of wood as far as possible, usually the very lightest wood consistent with the necessary strength, in order to render them more buoyant. This buoyancy was not so essential, it was believed, except as an aid in securing the initial upward movement of the gate. The head for producing this movement was often difficult to obtain because of circumstances tending to diminish the low water discharge. Hence, owing to the use of such material the leaves of the gate were frequently weak structurally, a very serious defect in such a device, causing them to warp and twist, and not infrequently to jamb between their piers. Also the lightness of the gates rendered them buoyant at inopportune times, permitting them to rise when it was desired to have them remain down. In consequence of these structural and working defects many modifications of the original developed, retaining, however, in them all the main principle of the gate invented by White and Hazard. Some of the modified bear traps were fairly successful, but involved objectionable complications. On the whole they were comparatively satisfactory for logging dams and minor navigation works, but were impracticable for important slackwater improvements, being in great measure unreliable and undependable. Not until the erection of two bear-traps in Herr island dam, in 1901, was there any radical departure from the old wooden gates tending to overcome their physical and operating defects. The Herr island gates are of the simplest form of that type of dam—the lower leaf hinged at its downstream edge and the upper at its upstream edge, the latter lapping over nearly one-half the upstream portion of the former when down. When first contemplated of wood the usual difficulty of no initial head at time to affect a raising presented itself. Several propositions were entertained, among them that of securing water from Allegheny city through the supply mains. However, when it was discovered that more than 1,000,000 gallons would probably be required within ten minutes for the occasional raising of only one gate the idea was abandoned. A continuation of the search for other means for overcoming the gigantic obstacles previously mentioned eventually resulted in the determination to construct a hollow structural steel lower leaf, which, by means of air for expulsion of the water contained therein, might be made even more buoyant than a wooden gate, and at the same time produce a structure of any desired rigidity. Thus, if successful, air would always be available at much less cost than any other means of initial raising and all objectionable features of the old wooden gates would be successfully overcome.

ADVANTAGE OF STEEL GATES.

These gates have now been in use more than six years, have been maneuvered hundreds of times under every possible condition and have met the highest expectations of their designers. They have been duplicated on the Ohio river with only two or three minor changes, two having been constructed at each of dams 3, 4 and 5, which have been operated during the present season with even greater success. They can be lowered in less than a minute, and raised in from 5 to 8 minutes, under full pool conditions, and under some conditions in even less time. With sufficient water head they rise without the use of air, but air can always be introduced when needed at a trifling cost. Never have the steel bear-

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traps failed in the performance of their functions nor required material repairs. Those constructed in this vicinity are uniformly 94 ft. 4 in. wide between pier undercuts, and vary in vertical height above sills from 10 to 13½ ft. Two such traps can readily pass the equivalent of a 7½-ft. open river stage of water as registered by the Davis island gage. Thus their great advantage for operating purposes can readily be seen. These gates are in pairs in all of the movable dams except Nos. 1 and 2, Ohio river, and are steel except the latter and at dam 6. The only all-wood gate is at dam 2 and is 102 ft. 4 in. wide. Those at Nos. 1 and 6 are composite—wood and steel—the former being 52 ft. wide and the latter two each 120 ft. The wooden and composite gates operate quite satisfactorily, possessing, however, in a measure the objectionable structural and operating defects before alluded to.

(To be continued.)

PORTAGE LAKE CANAL COMMERCE.

The report of Major Graham D. Fitch, corps of engineers, U. S. army, who is in charge of the harbors of Lake Superior, on the marine commerce of the Portage Lake ship canals for the calendar year 1908, has just been issued.

The report shows that the decrease in freight tonnage during the past year was 8.1 per cent. The navigation season covered a period of 230 days—from the opening on April 22 to the closing on Dec. 7.

During the year just passed these canals have been used by more of the large class of vessels than ever before and record cargoes have been carried through. Most of the vessels passed through the waterway without trouble, but the channels are narrow for this class of vessels and in consequence groundings, collisions and accidents have occurred. Boats have had comparatively no trouble passing through the Houghton-Hancock bridge, which has given good service during the year.

The heaviest commerce through the waterway was during the month of October, or in the stormy season, which shows clearly that these canals are used for refuge to a great extent, as there are more boats navigating Lake Superior during the months of July and August.

The total number of vessels using the waterway during the year 1908 was 3,085, of 2,265,304 net registered tons, and the total freight carried was 2,263,914 tons, valued at $77,323,898.

Launching the Alva C. Dinkey.

A workman of humble circumstances was once introduced to and left alone for a moment with a well-bred and refined woman. "Faith," thought he, "I wish I could think of something to say. Have you ever traveled in a box car, ma'am?"

The launching party that officiated at the launching of the bulk freighter, Alva C. Dinkey, named in honor of the president of the Carnegie Steel Co., at the Lorain yard of the American Ship Building Co., on Saturday last, can truthfully say that they have traveled in a box car. The rains of the week had made the ship yard a bit soft and it is well on to half a mile from the superintendent's office to the launching slip. The difficulty of transit was surmounted in a thoroughly practical manner by backing the yard locomotive attached to a box car (a very clean and well groomed one, by the way), up to the superintendent's office and conveying the party to the launching stand.

MISS LEONORA DINKEY ABOUT TO SMASH THE BOTTLE.

The steamer, which is building for the Pittsburg Steamship Co., was christened by Mr. Dinkey's little daughter Leonora and, as is usual with all launches of this yard, everything passed off finely. The water in the slip, however, was nearly three feet lower than usual, so that the great steamer had a drop of over 6 ft. This made a tremendous wave and as the yard was crowded with sightseers many of them had to scamper in order to save their feet from getting wet. The launching party was taken from Cleveland to Lorain in four special cars and as soon as the steamer was safely overboard, returned to Cleveland, where luncheon was served at the Hollenden.

Mr. Harry Coulby, president and general manager of the Pittsburg Steamship Co., was introduced by Mr. James C. Wallace, president of the American Ship Building Co., as toastmaster. Mr. Coulby said that in naming ships they were recognizing men who were instrumental in building up the business of the lakes. There would not be much lake business without steel works. The Carnegie Steel Co. he held to be the largest steel works in the world and with that he introduced Mr. Dinkey.

Mr. Dinkey said that he was sensible of the honor of having so great a ship named after him. He added that no city in the country uses as many of the products of the Carnegie Steel Co. as Cleveland does, and he also thought that Cleveland owed a great deal to Mr. Wallace, who had developed one of the greatest shipyards in the world. He offered a toast to Mr. Wallace.

This led Mr. Coulby to say that the party had attended a magnificent launching for which the Pittsburg Steamship Co. had paid, and an extremely light luncheon for which the American Ship Building Co. was paying, and with that he introduced Mr. Wallace, who promptly said that if he had known that Mr. Coulby was

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going to talk like that he would not have appointed him toastmaster. In his remarks he gave one to understand that building ships for Mr. Coulby was not a matter of unmixed joy as his specifications were usually pretty rigid.

Mr. W. G. Pollock, upon being introduced, made a most excellent speech. He said that in naming ships the companies named them first of all after those that had the money to pay for them, such as Amasa Stone and Samuel Mather; then they named them after the pirates, such as James H. Hoyt and Harvey D. Goulder; then after the dock men, such as Mr. Andrews, John A. Donaldson and W. G. Pollock; then after any old banker who would take the bonds, and finally after the men of great prominence in the trade, such as Alva C. Dinkey, and he hoped to live long enough to see an 800-ft. ship named after John R. Scott.

Brief speeches were made by Mr. Hermon A. Kelley and by Mr. W. P. Palmer, president of the American Steel & Wire Co. Mr. Palmer's remarks were of extreme felicity, but the one thing that hurt his feelings, he said, was the fact that the rigging of the Dinkey is made of English rope. He assured the American Ship Building Co. that Steel Corporation rope was quite as good as English rope.

Among those present were Mr. and Mrs. Alva C. Dinkey, Miss Leonora Dinkey, Mr. and Mrs. Kentch, Mrs. Taylor and I. M. Jenks, of Pittsburg; Mr. Harry Coulby, Mr. and Mrs. J. C. Wallace, Mr. R. C. Wetmore, Mr. J. L. Wallace, Mr. L. H. Wallace, Mr. Robert Logan, Mr. O. N. Steele, Mr. E. C. Collins, Mr. Robert Wallace, Capt. and Mrs. Charles L. Hutchinson, Mr. John M. Mulrooney, Mr. Walton H. McGean; Mr. W. F. Fitch, Mr. F. B. Smith, Mr. W. W. Watterson, Capt. and Mrs. W. J. Hunt, Capt. W. W. Smith, Mr. Hermon A. Kelley, Mr. Frank La Marche, Mr. Archie Paton, Capt. Ralph Lyons, Mr. W. H. Bosworth, Miss Mary Bosworth, Miss Ethel Forbes, Mr. and Mrs. E. M. Sprague, Mr. and Mrs. George Smart, Mr. F. H. Landon, Mr. Charles Gibson, Mr. Roy Williams, Capt. Ralph Byrns, Capt. H. F. Kelley, Capt. Fred A. Daley, Capt. S. C. Allen and Mr. Charles B. Calder, Toledo.

The Dinkey is 600 ft. over all, 580 ft. keel, 58 ft. beam and 32 ft. deep, having 34 hatches spaced 12-ft. centers. She will have triple expansion engines with cylinders 24, 39 and 65 in. diameters by 42-in. stroke, supplied with steam from two Scotch boilers, 16 ft. by 11 ft. 6 in., fitted with Ellis & Eaves draft and allowed 170 lbs. pressure. She will be sailed by Capt. W. J. Hunt.

THIS PHOTOGRAPH DOES NOT SHOW THE DINKEY LEAVING THE STOCKS BUT WAS TAKEN AS SHE WAS MAKING HER SECOND ROLL TO STARBOARD.

NORMAND & CO.

Mr. Joseph Normand, who for 10 years has been superintendent for Hunkin Bros. Construction Co. of Cleveland, has formed a company to be known as Normand & Co., and has purchased the steamer Mentor, which is equipped with a steel derrick with lifting capacity of 20 tons, centrifugal pump capacity 45,000 gallons per minute, and will carry on business of diving, wrecking, submarine pipe laying and sand and gravel dredging. The steamer Mentor can be reached at any time at the Cuyahoga Boiler Works, or 6610 Wakefield avenue.

The Cleveland lodge of the Licensed Tugmen's Protective Association has elected the following officers: E. E. Kemmett, president; Fred Carroll, vice president; Willis Brown, corresponding secretary; Joseph Normand, treasurer and financial secretary; Fred Carrol, A. G. Reagan, Wm. Tuff, trustees; W. J. Ryan, chaplain.

George W. Smith, superintendent of the Seneca Transportation Co., of Buffalo, which is the Lackawanna Steel Co.'s lake fleet, has been elected president of the Central Railway club. Mr. Smith is also traffic manager of the Lackawanna Steel Co.

William Ingersoll Bowditch, a famous navigator and author of several books on nautical subjects, died at his home in Brookline, Mass., Jan. 24, at the advanced age of 89. Mr. Bowditch was a son of Capt. Nathaniel Bowditch, a famous navigator, was born at Salem, Mass., and was a classmate at Harvard of James Russell Lowell, the eminent American poet.

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SHIP YARD NOTES.

E. W. Heath, Tacoma, Wash., will soon launch the gasoline schooner Active, building for the Tacoma Fish Co., and which is to operate near Petersburg, Alaska.

The Ker-Lloyd Iron Works, San Francisco, Cal., has a contract for the repairs to engines, boilers and hull of the army transport Sheridan, the work to be done at a cost of $1,480.

Ira F. Bushey, foot of Twentieth street, Brooklyn, N. Y., has already delivered six of the fifteen scows he is building for the Street Cleaning Department of the city of New York, and good progress is being made on the construction of the remainder.

The Moore & Scott Iron Works, San Francisco, Cal., has the contract for repairing and overhauling the steamer General McDowell, on their bid of $6,293, the work to be done in 18 days. The same company is to repair the steamer Riverside, for the sum of $1,404, work to be completed in seven days.

Charles L. Rhode & Sons Co., Baltimore, Md., have launched a large elevator and dredge which is 90 ft. long, 35 ft. beam and 9 ft. deep. Work is now being pushed on the upper works of the dredge. The harbor tug Greyhound is being rebuilt at this yard and the iron hull barge Michael Demsey, of Philadelphia, is also being given a general overhauling.

The Howard Ship Yards Co., Jeffersonville, Ind., is completing a towboat for the Finn Steamboat Line, the dimensions of which are as follows: 80 ft. long; 16 ft. beam; 3½ ft. deep. At the same yard a combined towboat and snagboat is being built for use of government engineers on the Kentucky river. This vessel is 145 ft. long, 30 ft. beam and 4½ ft. deep.

The Moore & Scott Iron Works, San Francisco, Cal., has obtained the contract for constructing a steel lighter for a South American company on their bid of $3,200. The other bids were as follows: Judson Mfg. Co., San Francisco, $6,000; United Sheet Metal Works, San Francisco, $4,590; United Engineering Works, San Francisco, $4,850; Muir & Symon, San Francisco, $4,704; Zenith Iron Works, San Francisco, $4,235. The lighter is to be shipped to South America in knocked-down condition.

The Bath Marine Construction Co., Bath, Me., which has recently established its plant in the North End, has taken a contract for the construction of its first vessel. It will be a seagoing yacht for Hartley C. Baxter, of Brunswick, Me., and is to be 80 ft. long and 14 ft. beam. It will be equipped with two engines of 100 H. P.

The Marine Boiler Works Co., Front and York streets, Toledo, O., built 15 Scotch marine boilers, 12 of which were installed in vessels built by the Great Lakes Engineering Works and three in a vessel built by the Toledo Ship Building Co.

The Byron Jackson Iron Works, San Francisco, Cal., are to furnish the turbine engines and pumps with which the two fireboats building for San Francisco are to be equipped. The hulls are being built by the Risdon Iron Works, of San Francisco.

The Luders Marine Construction Co., Port Chester, N. Y., is building a 60-ft. cruising power yacht for M. and C. Houck, of Greenwich, Conn. She was designed by A. E. Luders and is intended for entry in the Bermuda power boat race next season.

Connell & Co., New Glasgow, Nova Scotia, launched the sealing steamer Florizel recently. She is now being fitted up and is scheduled to leave for St. John's, Newfoundland, the last week in January. The Florizel is to have wireless apparatus installed, being the first sealing vessel to be so equipped.

The Heffernan Engine Works, Seattle, Wash., has been busily engaged on the work of fitting oil-burning apparatus in the steamships Hyades and Pleiades, the contract for the latter calling for the completion of the work by Jan. 1. The Pleiades has been chartered by the American-Hawaiian Steamship Co. for Puget Sound-Honolulu service.

The Spedden Ship Building Co., Baltimore, Md., has recently completed two locomotive type boilers for the dredge Kennedy, owned by the Maryland Dredging & Contracting Co., of Baltimore. The boilers are each 5 ft. 6 in. in diameter and 23 ft. 9 in. long. As soon as the Kennedy ceases operations on the channel for the winter she will go to the yard and have the boilers installed.

The W. & A. Fletcher Co., Hoboken, N. J., are pushing work on the new Hudson River Day Line steamer Trojan and she will be ready to go into service early in the season. The same company has recently overhauled the engines and boilers of the burned steamer New York and they have been sent to Camden, N. J., to be installed in the new steamer Robert Fulton, to be built by the New York Ship Building Co.

Crawford & Reid, Tacoma, Wash., lauched the steamer Daring, building for Capt. McDowell for the East Pass run between Seattle and Tacoma, on Jan. 28. The new steamer is to be a speedy craft and is to be equipped with the most modern passenger accommodations. She is of wood and is 115 ft. long, 19.6 ft. beam and 9 ft. depth of hold. It is expected to have the Daring in service by April 1.

Stearns & McKay, Marblehead, Mass., are building a novel cruising yacht for Henry A. Church, of Boston, a well-known yachtsman. She is to be christened Intrepid and is a 60-ft. auxiliary schooner yacht, rigged with pole masts.

The William Cramp Ship & Engine Building Co., Philadelphia, Pa., is building a sea brake for the battleship Indiana, consisting of a pair of wings 13 ft. long by 6 ft. wide, to be attached to the sides of the vessel and hinged perpendicularly, so that when it is desired to check the speed they may be opened. The wings are to be given a trial by the navy department with a view to equipping other ships with the device if it is successful.

The New York Ship Building Co., Camden, N. J., has almost completed two of the fleet of steel barges which it is building for the Lehigh Valley Railroad Co. for use in transporting coal from its yards at Perth Amboy to other points on the coast. This is one of the first instances of the use of steel barges for carrying coal. Each of the craft carries 1,900 tons of cargo. They are 200 ft. in length.

The Newport News Ship Building & Dry Dock Co. Newport News, Va., launched the cable-laying steamer Joseph Henry, Dec. 30. She is building for the war department and is to be completed in about two months at a cost of $200,000. The Henry is 200 ft. long, 32 ft. beam and 17 ft. deep and is to be fitted with twin-screw, triple expansion engines. She is designed to maintain a speed of 13 statute miles per hour.

The Newport News Ship Building & Dry Dock Co., Newport News, Va., has been awarded a contract by the Matson Navigation Co., of San Francisco, Cal., for the construction of a steamer 450 ft. long, 54 ft. beam and 24 ft. deep with a cargo-carrying capacity of 6,000 tons. The new vessel is to have a speed of 15 miles per hour and will cost in the neighborhood of $800,000. The Newport News company built the Lurline, a somewhat smaller vessel for the same owner last year. Like the Lurline the new steamer will be an oil burner and the machinery will be placed aft. There are to be accommodations for 100 passengers.

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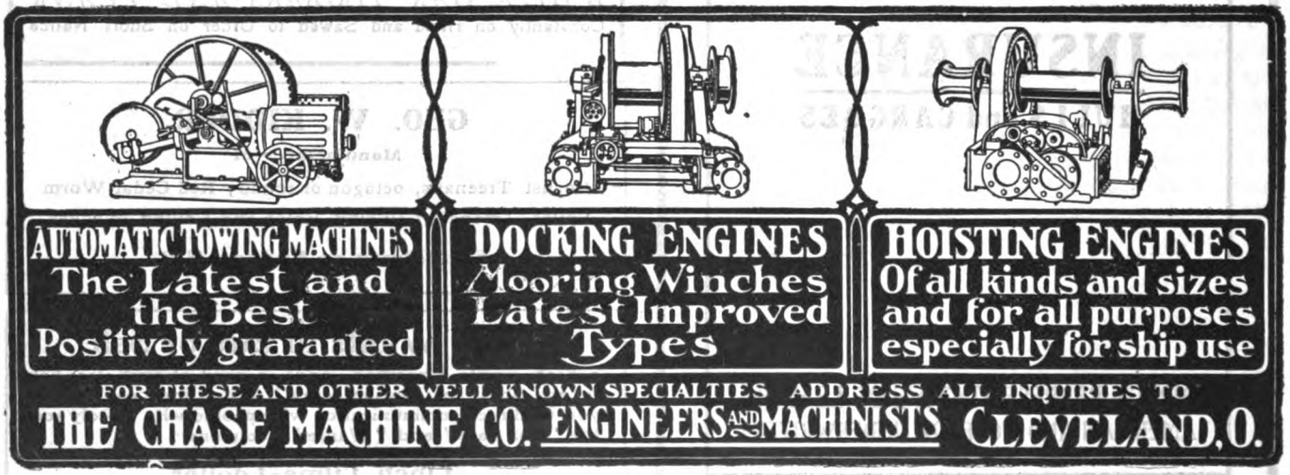

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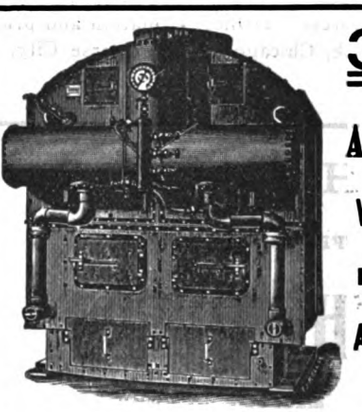

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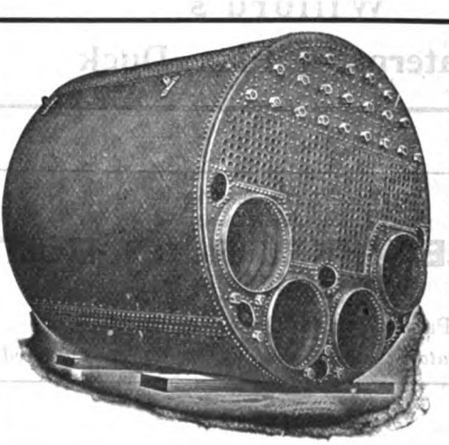

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Mehl, Edward, Erie, Pa.
Mitchell & Co., Cleveland, O.
O'Connor, J. J., Port Arthur, Ont.
Parker Bros., Ltd., Detroit, Mich.
Richardson, W. C., Cleveland, O.
Sullivan & Co., D., Chicago, Ill.
Vance & Joys Co., Milwaukee, Wis.

ANCHORS.

Baldt Anchor Co., Chester, Pa.
Bowers & Co., L. M., Binghamton, N. Y.
Upson-Walton Co., Cleveland, O.

ARCHITECTS (Naval).

Babcock & Penton, Cleveland, O.
Curr, Robert, Cleveland, O.
Ekstrom, G., Detroit, Mich.
Kidd, Joseph, Duluth, Minn.
Linch, Chas. S., N. A. & M. E., Philadelphia, Pa.
Nacey & Hynd, Cleveland, O.
Nevins & Smith, Chicago and Cleveland.
Wilby, Carlton, Detroit, Mich.
Wood, W. J., Chicago, Ill.

APPARATUS (Steering).

Akers Steering Gear Co., Chicago, Ill.
American Ship Building Co., Cleveland, O.
Chase Machine Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Detroit Ship Building Co., Detroit, Mich.
Hyde Windlass Co., Bath, Me.
Sheriffs Mfg. Co., Milwaukee, Wis.

APPARATUS (Submarine Diving).

Morse & Son, A. J., Boston, Mass.
Schrader's Son, Inc., A., New York, N. Y.

ARMORS (Submarine).

Morse & Son, Inc., Andrew J., Boston, Mass.
Schrader's Son, Inc., A., New York, N. Y.

ATTORNEYS AND PROCTORS IN ADMIRALTY

Gilchrist, Albert J., Cleveland, O.
Goulder, Holding & Masten, Cleveland, O.
Hyner, P. D., Erie, Pa.
Hoyt, Dustin, Kelley, McKeehan & Andrews, Cleveland, O.
Jenkins, Russell & Eichelberger, Cleveland, O.
Kremer, C. F., Chicago, Ill.
MacDonald, Ray G., Chicago, Ill.
Marshall, Alexander, Duluth, Minn.
Shaw, Warren, Cady & Oakes, Detroit, Mich.

BAROMETERS, GLASSES, ETC. (Marine).

Ritchie & Sons, E. S., Brookline, Mass.

BARS (Arch).

Pittsburg Forge & Iron Co., Pittsburg, Pa.

BARS (Iron or Steel—Hollow Staybolt).

Falls Hollow Staybolt Co., Cuyahoga Falls, O.

BEARING METALS (White Bronze).

American Manganese Bronze Co., New York, N. Y.

BELLS (Engine Room Telegraph Call, Etc.).

Cory & Son, Chas., New York, N. Y.

BLOCKS, SHEAVES, ETC.

Boston & Lockport Block Co., Boston, Mass.
Dominion Wire Rope Co., Ltd., Montreal, Can.

BOATS (Builders).

Drein, Thos., & Son, Wilmington, Del.
Hall Bros. Marine Railway & Ship Building Co., Winslow, Wash.
Truscott Boat Mfg. Co., St. Joseph, Mich.

BOILERS.

Almy Water Tube Boiler Co., Providence, R. I.
American Ship Building Co., Cleveland, O.
Atlantic Works, East Boston, Mass.
Briggs, Marvin, New York, N. Y.
Chicago Ship Building Co., Chicago, Ill.
Clyde Ship Building & Eng'g Co., Port Glasgow, Scotland.
Copeland Co., E. T., New York. (Copeland Scotch Improved.)
Cramp, Wm., & Sons, Philadelphia, Pa.
Delany, P., & Co., Newburgh, N. Y.
Detroit Ship Building Co., Detroit, Mich.
Fletcher, W. A., & Co., Hoboken, N. J.
Fore River Ship Building Co., Quincy, Mass.
Great Lakes Engineering Works, Detroit, Mich.
Griscom-Spencer Co., New York, N. Y.
Johnston Brothers, Ferrysburg, Mich.
Kingsford Foundry & Machine Works, Oswego, N. Y.
Manitowoc Boiler Works, Manitowoc, Wis.
Maryland Steel Co., Sparrow's Point, Md.
McIntyre & Henderson, Baltimore, Md.
Milwaukee Dry Dock Co., Milwaukee, Wis.
Moran, Co., Seattle, Wash.
New York Ship Building Co., Camden, N. J.
Quintard Iron Works Co., New York, N. Y.
Roberts Safety Water Tube Boiler Co., New York, N. Y.
Superior Ship Building Co., Superior, Wis.
Toledo Ship Building Co., Toledo, O.

BOLTS.

Pittsburg Forge & Iron Co., Pittsburg, Pa.

BOOKS.

Penton Publishing Co., The, Cleveland, O.

BRASS GOODS.

Michigan Lubricator Co., Detroit, Mich.
Penberthy Injector Co., Detroit, Mich.

BRIDGES.

Scherzer Rolling Lift Bridge Co., Chicago, Ill.

BRONZE.

American Manganese Bronze Co., New York, N. Y.

BRONZE (Manganese).

American Manganese Bronze Co., New York, N. Y.

BUCKETS (Ore and Coal).

Brown Hoisting Machinery Co., Cleveland, O
Hayward Co., The, New York, N. Y.

BUOYS, BOATS, PRESERVERS, ETC. (Life).

Armstrong Cork Co., Pittsburg, Pa.
Drein & Son, Thos., Wilmington, Del.
Kahnweiler's Sons, David, New York, N. Y.
Lundin, A. P., New York, N. Y.

BUOYS (Gas).

Safety Car Heating & Lighting Co., New York, N. Y.

CABLES (Dredge).

Dominion Wire Rope Co., Ltd., Montreal, Can.

CABLES (Mooring).

Dominion Wire Rope Co., Ltd., Montreal, Can.

CABLES (Swinging).

Dominion Wire Rope Co., Ltd., Montreal, Can.

CABLES (Wire).

Dominion Wire Rope Co., Ltd., Montreal, Can.

CANVAS.

Baker & Co., H. H., Buffalo, N. Y.
Upson-Walton Co., Cleveland, O.

CAPSTANS.

American Ship Windlass Co., Providence, R. I.
Chase Machine Co., Cleveland, O.
Dake Engine Co., Grand Haven, Mich.
Gillett & Eaton, Lake City, Minn.
Hyde Windlass Co., Bath, Me.

CAPSTANS (Steam).

Chase Machine Co., Cleveland, O.
Gillett & Eaton, Lake City, Minn.

CASTINGS (Brass and Bronze).

Cramp, Wm., & Sons, Philadelphia, Pa.
American Manganese Bronze Co., New York, N. Y.
Great Lakes Engineering Works, Detroit, Mich.
Fore River Ship Building Co., Quincy, Mass.
Griscom-Spencer Co., New York, N. Y.
McIntyre & Henderson Co., Baltimore, Md.

CASTINGS (Steel).

Otis Steel Co., Cleveland, O.

CAULKERS (Ship).

McIntyre & Henderson, Baltimore, Md.

CHAINS.

Seneca Chain Co., Kent, O.

CHANDLERS (Ship).

Baker, Howard H., & Co., Buffalo, N. Y.
Great Lakes Supply Co., Buffalo, N. Y., and Duluth, Minn.
Griscom-Spencer Co., New York, N. Y.
Upson-Walton Co., Cleveland, O.

CHARTS.

Penton Publishing Co., Cleveland, O.

CHOCKS.

Dominion Wire Rope Co., Ltd., Montreal, Can.

CIRCULATORS (Automatic).

Copeland Co., E. T., New York, N. Y.

CLOCKS AND CHRONOMETERS (Marine).

Ritchie, E. S., & Sons, Brookline, Mass.

CLOTH (Waterproof).

Bunker, E. A., New York, N. Y.

COAL (Producers and Shippers).

Hanna, M. A., & Co., Cleveland, O.
Lorain Coal & Dock Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.
Pittsburg Coal Co., Cleveland, O.

COMPASSES.

Ritchie, E. S., & Son, Brookline, Mass.

COMPOUNDS (Lubricating).

Cook's Sons, Adam, New York, N. Y.

CONDENSERS.

Great Lakes Engineering Works, Detroit, Mich.

CONTRACTORS (Dredging).

Breymann & Bros., G. H., Toledo, O.
Buffalo Dredging Co., Buffalo, N. Y.
Dunbar & Sullivan Dredging Co., Buffalo, N. Y.
Great Lakes Dredge & Dock Co., Chicago, Ill.
Northern Dredge Co., Duluth, Minn.
Starke Dredge & Dock Co., C. H., Milwaukee, Wis.
Sullivan, M., Buffalo, N. Y.

CONTRACTORS. (Pile Driving and Submarine.)

Buffalo Dredging Co., Buffalo, N. Y.
Dunbar & Sullivan Dredging Co., Buffalo, N. Y.
Great Lakes Dredge & Dock Co., Chicago, Ill.
Parker Bros. Co., Ltd., Detroit, Mich.
Starke Dredge & Dock Co., C. H., Milwaukee, Wis.
Sullivan, M., Buffalo, N. Y.

CONTRACTORS (Public Work).

Breymann Bros., G. H., Toledo, O.
Buffalo Dredging Co., Buffalo, N. Y.
Dunbar & Sullivan Dredging Co., Buffalo, N. Y.
Griscom-Spencer Co., New York, N. Y.
Great Lakes Dredge & Dock Co., Chicago, Ill.
Starke Dredge & Dock Co., C. H., Milwaukee, Wis.
Sullivan, M., Buffalo, N. Y.

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